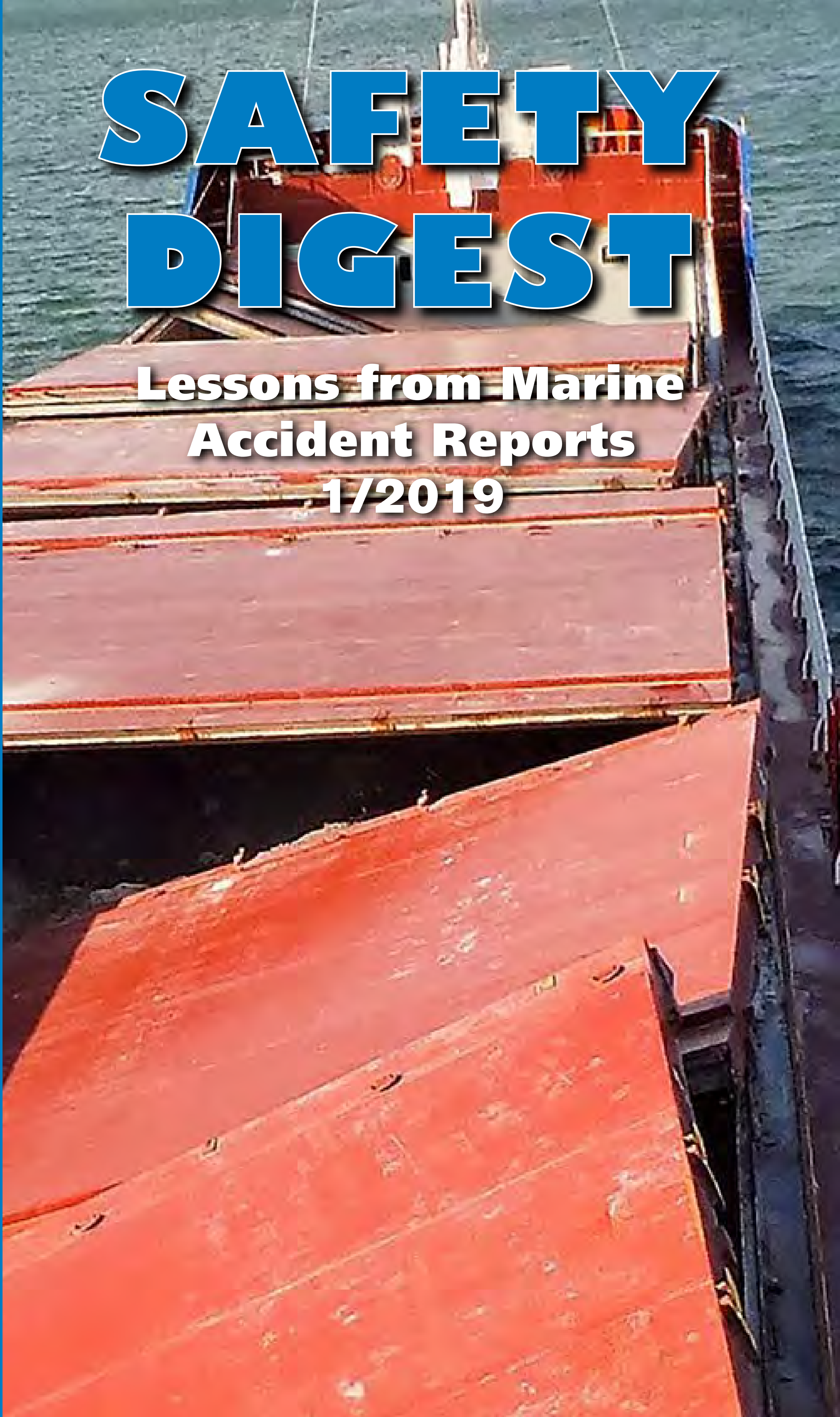
SAFETY DIGEST

Lessons from Marine Accident Reports 1/2019

MARINE ACCIDENT INVESTIGATION BRANCH

MAIB



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No 1/2019

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April 2019

MARINE ACCIDENT INVESTIGATION BRANCH

The Marine Accident Investigation Branch (MAIB) examines and investigates all types of marine accidents to or on board UK vessels worldwide, and other vessels in UK territorial waters.

Located in offices in Southampton, the MAIB is a separate, independent branch within the Department for Transport (DfT). The head of the MAIB, the Chief Inspector of Marine Accidents, reports directly to the Secretary of State for Transport.

This *Safety Digest* draws the attention of the marine community to some of the lessons arising from investigations into recent accidents and incidents. It contains information which has been determined up to the time of issue.

This information is published to inform the shipping and fishing industries, the pleasure craft community and the public of the general circumstances of marine accidents and to draw out the lessons to be learned. The sole purpose of the *Safety Digest* is to prevent similar accidents happening again. The content must necessarily be regarded as tentative and subject to alteration or correction if additional evidence becomes available. The articles do not assign fault or blame nor do they determine liability. The lessons often extend beyond the events of the incidents themselves to ensure the maximum value can be achieved.

Extracts can be published without specific permission providing the source is duly acknowledged.

The Editor, Jan Hawes, welcomes any comments or suggestions regarding this issue.

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MARINE ACCIDENT INVESTIGATION BRANCH

The role of the MAIB is to contribute to safety at sea by determining the causes and circumstances of marine accidents and, working with others, to reduce the likelihood of such causes and circumstances recurring in the future.

Extract from
The Merchant Shipping
(Accident Reporting and Investigation)
Regulations 2012 – Regulation 5:

"The sole objective of a safety investigation into an accident under these Regulations shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of such an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

INDEX

Glossary of Terms and Abbreviations

AHTS - Anchor Handling Tug Supply
AIS - Automatic Identification System
C - Celsius
CCTV - Closed Circuit Television
CFPP - Cold Filter Plugging Point
CO_2 - Carbon Dioxide
COSWP - Code of Safe Working Practices for Merchant Seamen
CPR - Cardio-Pulmonary Resuscitation
DSC - Digital Selective Calling
ECDIS - Electronic Chart Display and Information System
ECS - Electronic Chart System
EPIRB - Emergency Position Indicating Radio Beacon
GPS - Global Positioning System
GRP - Glass Reinforced Plastic
gt - Gross tonnage
HMPE - High Modulus Polyethylene
IBA - Incinerator Bottom Ash
ILO - International Labour Organization
IMSBC - International Maritime Solid Bulk Cargoes
kts - knots
m - metre
"Mayday" - The international distress signal (spoken)
MBL - Minimum Breaking Load
MCA - Maritime and Coastguard Agency
MGN - Marine Guidance Note
MGO - Marine Gas Oil
MOB - Man overboard
OOW - Officer of the Watch
"Pan Pan" - The international urgency signal (spoken)
RHIB - Rigid-Hulled Inflatable Boat
RNLI - Royal National Lifeboat Institution
SOLAS - International Convention for the Safety of Life at Sea 1974, as amended
SWL - Safe Working Load
t - tonne
VHF - Very High Frequency
VTS - Vessel Traffic Services

Introduction

At the start of this introduction, I'd like to thank this edition's introduction writers. I am delighted that Captain Nick Nash, Andrew Locker and Steve Gravells have agreed to write the introductions to the merchant, commercial fishing and recreational craft sections of this digest. All three have written from both their professional and own personal perspectives, and their words are very powerful. If you read nothing else in this issue, I would encourage you to read the section introductions.

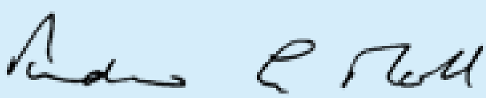
When I took command of HMS YORK, the squadron navigator gave me some advice that has stayed with me throughout my seagoing career. Very simply, it was to check the emergency steering thoroughly before letting go to leave port, or before entering pilotage waters on the way in. Doing this ensured that: everyone was closed-up in their correct position, the communications worked; the rudder angle indicator and gyro repeater in the steering gear compartment were reading correctly and, importantly, the secondary and local steering systems actually functioned. The first time we did this it was a right pain. By the time we were doing it for the third or fourth time everyone's confidence in and knowledge of the system had increased immeasurably. When one day the primary steering system did fail as we made our way into harbour, we took it in our stride and berthed as if nothing had occurred.

I'm putting this story in my introduction because this issue of the digest has many examples of accidents that could have been avoided altogether, or at least somewhat mitigated, had the individuals involved spent a bit more time getting to know the reversionary operating modes of their safety critical systems. When things are going wrong, the human endocrine system has a tendency to flood the body with adrenaline. This hormone dates from the time of our earliest ancestors. It is useful if you need to run away from a sabre-tooth tiger, but damn all help if you are trying to read some small print instructions by torchlight when the alarms are sounding all around you. So, please take the time to thoroughly learn your systems before the fur starts flying, and make a point of testing them before you need them.

The second theme I would like to highlight from this issue is that of providing a safe means of access to your vessel. As I write, the MAIB has started two investigations into fatal accidents (see Appendix A). One accident occurred as a crewman was attempting to leave his vessel; the second as a crewman was trying to board. Both accidents happened when the vessels were moving or about to move. It is likely that both individuals were trying to be helpful and to get things done quickly, but there were better ways of getting the lines ashore or letting go, and the shortcuts cost them their lives. The investigation reports will be published later in the year, but in the meantime may I ask you to review your procedures for passing and letting go mooring lines to ensure you are not putting anyone at risk.

As always, when you have finished reading this edition of the MAIB's Safety Digest, please pass it to someone you feel will genuinely benefit from reading these articles. If you are reading this on-line, then send on the link: there is no limit to the number of people who can learn from the experiences of others.

Be safe.



Andrew Moll
Chief Inspector of Marine Accidents

April 2019

Part 1 - Merchant Vessels

DECIDE!

This is where all your training, bridge team resources, experience and local knowledge (including the pilot's) lead to the ultimate decision – 'to go or not to go'.

However before we get to that place, you as master should have done an "invisible check/confirmation" that your ship's 'BET' is in place and robust enough for you to enter or leave the port confidently and safely. Whether you do this at the start of each voyage or at the beginning of your contract, 'BET' should always be at the back of your mind.

'BET' in this case doesn't refer to the lottery, but:

B - Bridge Team Management (inc communications)
E - Ergonomics (bridge equipment & controls layout
T - Training

Is your Bridge Team Management robust enough? Have all the deck officers been fully trained in its practical use? Do you use BRM consistently? Are you leading from behind with a well-briefed plan and good bridge team cohesiveness (consider closed loop communications) taking into account your team's previously noted 'BRM procedural drifts'?

Are the bridge Ergonomics good and equipment, displays and controls well laid out? If not are you, your team and the pilot (and your company) fully aware of any controls or switches that can be operated in error? For example, this could include the critical steering or engine telegraph systems, particularly when switching control stations – i.e. to the bridge wings.

Can the log speed readout be confused with the echo sounder readout particularly by a stressed navigator or pilot? Have the team considered using a "Head Up" display in pilotage waters?

Finally, has your team been Trained on the bridge equipment? Have they been fully briefed on your steering switchover and control switchouts to the bridge wings? Is everyone fully updated on the ship's present version of ECDIS and Track (auto) pilot systems and most importantly their display settings and limitations?

On a port approach or departure this "BET" must be in the background as you make that critical decision that must take precedence over all other decisions a captain will make that day, overriding e-mails, conference calls, cargo/passenger issues and scheduling.

One major self-help tool seafarers out at sea can easily use to check that their own ship's "BET" is robust enough are the MAIB reports, certain reports selected from its cousin the AAIB and The MAIB Safety Digest. The 'Digest' stands out with its sometimes 'tongue in cheek' easy to remember incident titles while giving a clean summary of the pertinent facts, a sensible narrative and conclusions without apportioning blame. This is something we, as sailors, appreciate.

We can learn from others' misfortunes and errors, we don't need to blame them.

One from The AAIB stands out: 30 years ago a Boeing 737 crashed on to the embankment of the M1 motorway, near Kegworth, Leicestershire, England, while attempting to make an emergency landing at East Midlands Airport on 8 January 1989. Of the 126 people aboard, 47 died and 74 sustained serious injuries. The AAIB report's recommendations included, among others, better CRM, improved cockpit engine instrument ergonomics and crew training – a full 'BET' failure.

A few pertinent 'BET' lapses can be found in the following MAIB investigation reports:

BRM: - Heavy contact made by container vessel 'CMA CGM Centaurus' with quay and shore cranes at Jebel Ali, United Arab Emirates May

2017. Excessive speed was one of the main causes coupled with poor BRM, pilot/master interchange and lack of a well thought out plan. Pilot/Bridge Team communications were also a major cause along with the Port/Pilot Management.

Ergonomics: - Collision between the pure car carrier 'City of Rotterdam' and the ro-ro freight ferry 'Primula Seaways' on the River Humber in December 2015. The report noted that the car carrier was of an unconventional design and the pilot's disorientation was due to 'relative motion illusion', which caused the pilot to think that the vessel was travelling in the direction in which he was looking.

Training: - The grounding of 'Pride of Canterbury' on The Downs – off Deal, Kent, January 2008. One of the recommendations was where an electronic chart system is fitted as an aid to navigation, proper generic and/or type specific training in its use should be provided to all navigating officers to ensure a thorough understanding of its display and functionality.

These are just 3 reports and although each had numerous recommendations, I have picked the ones that stood out for me and fit clearly into my "BET" acronym, which we use when discussing The Digest at our monthly on board "Nautical Meetings". I try to involve the team in using the "BET" idea to identify the recommendation which stands out the most and then ensure we try to identify our own "Procedural Errors" within that recommendation.

The Jebel Ali incident was one I remember that we particularly discussed at our onboard team meeting as it well highlighted a couple of points within the BRM/communication envelope.

1. Master/Pilot Exchange - following this report and others in the same vein - we now try to send our Pilot card and approach/docking plan to the port/pilots 48 hours in advance. Hopefully this will allow both parties to be on the same game plan at the start of the exchange.
2. Speed – The speed of the 'CGM Centaurus' was, in hindsight, too fast to achieve the required ROT into the Terminal 1 basin. We reassessed our own speeds of approach and harbour 'turn ins' and double-checked that we could achieve the required ROT with an adequate safety margin.

We can always learn from others' mistakes, and reading MAIB reports and the non-confrontational "Digest" give our onboard meetings some foundations to reassess our own 'BET' while we're out at sea and away from our own Marine Operations & training establishments.

The old adage "Make sure your "BET" is in place before the game starts" is very true! And always remember...

"*Doubt is the beacon of the wise*"

William Shakespeare 1564-1616

CAPTAIN NICK NASH, MNM, CMMAR, FRIN, FNI.
SHIPMASTER & PRESIDENT THE NAUTICAL INSTITUTE

Nick Nash was born in Penzance, Cornwall, where he still lives. He ran away to sea in 1977 as a deck cadet with Port Line/Cunard cargo serving on general cargo, banana boats, oil tankers and container ships. Nine years later he joined the Royal Fleet Auxiliary as a 3rd officer serving on fleet oil tankers and landing ships in support of the Royal Navy. He passed for Master in 1988, and joined P&O/Princess Cruises in 1989 as 3rd officer. He was promoted to staff captain in 1997 and captain in 2002. He is currently senior master of the 'Royal Princess', a 144,000 GRT cruise liner.

Nick is a part time consultant at Carnival's Arison Maritime Center – CSMART - simulator training facility in Amsterdam, where he has also helped teach BRM and ship handling - of which he has recently written a book – 'Shiphandling Passenger Ships - without Tugs'. He is the president of The Nautical Institute and was recently awarded the Merchant Navy Medal for meritorious service. Nick is an advanced driver, holds a PSV (bus) licence and enjoys navigating the canals of England and France in a narrow boat with his wife Sue, and a Border terrier.

CASE 1

When Your Watch is Dragging...

Narrative

Strong winds and tidal streams were forecast when the master of a small general cargo vessel was forced to change his plans and anchor overnight in an estuary to await a bunker barge. The vessel had not been able to take bunkers when alongside, and had insufficient fuel to reach its next port.

After sailing with a river pilot on board, the vessel proceeded to an anchorage as advised by the VTS. It was then anchored 40 minutes before low water in a depth of 12m using 5 shackles of cable. Several other vessels were also at anchor close-by. Shortly afterwards, the master handed over the bridge watch to the second officer, the pilot disembarked, and the main engine was stopped.

While on watch, the second officer remained on the bridge correcting charts. He was alone, and checked the vessel's position every 30 minutes. During one of the checks, the second officer noticed that the vessel had moved significantly closer to one of the other anchored vessels. As predicted, the easterly wind was now force 9 and the rate of the north-westerly flooding tidal stream had increased to over 2.5kts. The cargo vessel had been dragging its anchor for about 10 minutes at a speed of up to 1.4kts, and the second officer immediately alerted the master and called the engineer to start the main engine.

By the time the cargo vessel's engineer had dressed and started the main engine it was too late to avoid a collision. The cargo vessel struck the other vessel at anchor, which then also started to drag. Both vessels then collided with a third vessel, which was also at anchor. Nobody was injured but all the vessels sustained damage (see figure).

The Lessons

1. **The ability of an anchor to bite and continue to hold relies heavily on sufficient length of chain cable being used, particularly when strong winds and tidal streams are experienced and the tidal range is large. In such conditions, the more anchor cable used the more likely a master's rest will remain undisturbed.**

2. **During anchor watches, bridge watchkeepers frequently use the time to catch up with a variety of tasks. Usually this is time well spent. However, position monitoring remains a key task, the frequency of which depends on local conditions and circumstances. The longer the interval between checks, the further a ship might have dragged towards danger.**

3. **Automatic anchor watch alarm functions that are available on GPS receivers appear to be seldom used on merchant ships, even those not equipped with ECDIS or ECS. Yet such facilities, which are relatively quick and straightforward to set up, can provide real-time warning and a greater peace of mind.**

4. **The options available when a ship drags its anchor are extremely limited if its propulsion is not available. Occasionally, when conditions dictate, this means having engines at immediate readiness.**

Figure: Damage to the small cargo vessel

Re-boot the Engine with the off-on Switch

Narrative

About 10 minutes into a 70-minute scheduled trip, a small coastal passenger cruiser suffered a main engine failure that resulted in an engine room fire. There were no injuries but the vessel had to be taken out of service.

The master was first alerted to a problem with the port main engine when alarms sounded in the wheelhouse. The master's initial reaction was to bring the engine speed control lever to neutral and stop the engine. Then, without attempting to investigate or diagnose the problem, he silenced the alarms and attempted to restart the port engine. The engine failed to start so the master turned the vessel around, returned to the berth, and disembarked the passengers.

When the master opened the engine room door to investigate the problem, he was met by smoke. Unable to enter the engine room, he decided to ventilate the space by opening a hatch on the vessel's aft deck.

With the hatch open, the master saw flames on the top of the port engine. He instructed his crew to close all hatches and vents to the engine room, and then alerted the company office and requested the assistance of the local fire and rescue service. The engine room's fixed CO_2 fire-extinguishing system was then operated. The fire and rescue service attended the vessel and extinguished the fire within 30 minutes.

Post-fire examination of the port main engine and its electrical starting system identified an intermittent fault on the wheelhouse engine starter button (Figure 1). This allowed the engine starter motor solenoid to remain energised, and to overload and ignite the electrical cabling (Figure 2).

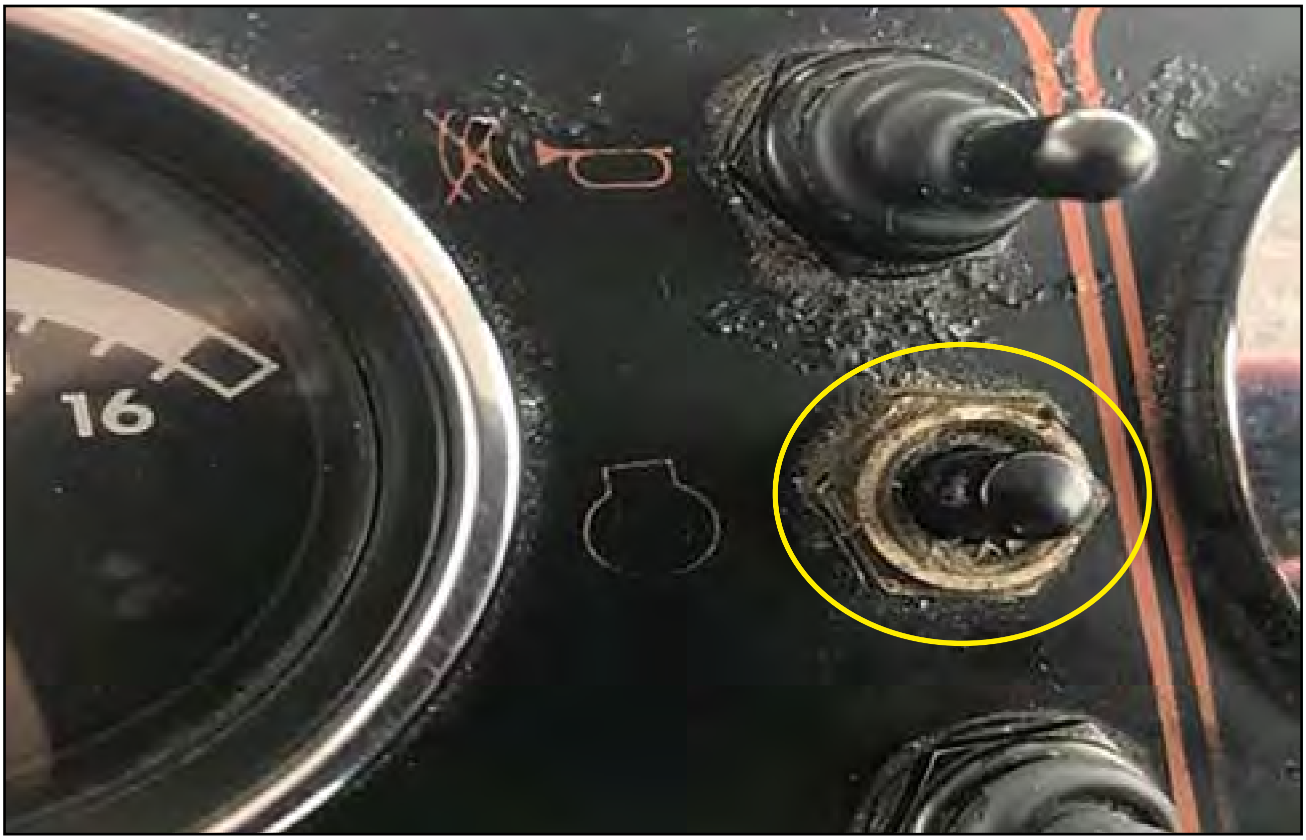


Figure 1: Main engine starter button

Figure 2: Heat damage to electrical cabling

The Lessons

1. On board the passenger vessel it was standard practice to start and stop the engines remotely from the wheelhouse without conducting routine inspections of the engines or the engine room. There are many things that can go wrong when engines are started or stopped, so they should always be closely inspected whenever their operating condition has changed.

2. To avoid complacency, always err on the side of caution. Machinery alarms are provided for a reason, so positive action should be taken immediately to investigate their cause.

3. The master and his crew demonstrated a lack of understanding about the potential consequences of opening a smoke-filled compartment to atmosphere. With little or no ventilation, a fire in an engine room can consume the remaining oxygen and decline in intensity. However, opening and ventilating the space before temperatures have returned to normal introduces oxygen to a hot area, and this can quickly feed or re-start a fire. In some cases a flashback and explosion may even occur. Close down the space, introduce a fire-reducing agent (i.e. CO_2) and monitor boundary temperatures until recurrent measurements show consistently low readings.

Lead Not Fair for Fairlead

Narrative

A passenger ferry was attempting to moor on a berth with a strong groundswell in strong winds when, without warning, one of its mooring line bollards was ripped from the deck. The ferry had to be taken out of service for several days to facilitate repairs to its deck plating and a roller fairlead (Figure 1). Fortunately, nobody was injured.

The effects of the groundswell in the port, and the difficulty of berthing in strong winds, were well known to the ferry operator. Between 2015 and 2017 the company recorded 21 instances of mooring line failures, with some causing minor injuries to ships' crews. The main solution to the problem was to equip the vessel with stronger mooring ropes.

In normal benign conditions the crew used 48mm diameter, 8-strand polypropylene plaited rope to moor the vessel. In more difficult conditions they used larger 64mm diameter ropes. In the worst conditions, a 9m long, 80mm diameter mooring rope was used as a back spring. This 80mm rope had a soft eye spliced at each end. The minimum breaking load (MBL) for the 48mm, 64mm and 80mm ropes was 43t, 75t and 116t respectively. The safe working load (SWL) of the damaged bollard and roller fairlead was 20t and 12t respectively.

Prior to arrival in the port, the master's mooring plan and decision to use the 64mm mooring lines was explained to the deck crew during a toolbox talk. However, during the mooring operation, the 80mm rope was used as the back spring. The back spring was passed through one of the vessel's roller fairleads and its eye splices were looped over bollards on the deck and the quayside (Figure 2).

It was evident that the forces acting on the mooring line - because of the combined effects of the wind and groundswell - did not reach its MBL but significantly exceeded the SWL of the vessel's deck fittings. This happened because the SWL of the deck fittings had not been properly considered when the size of the mooring line was increased.

Figure 1: Roller fairlead and bitts (before and after)

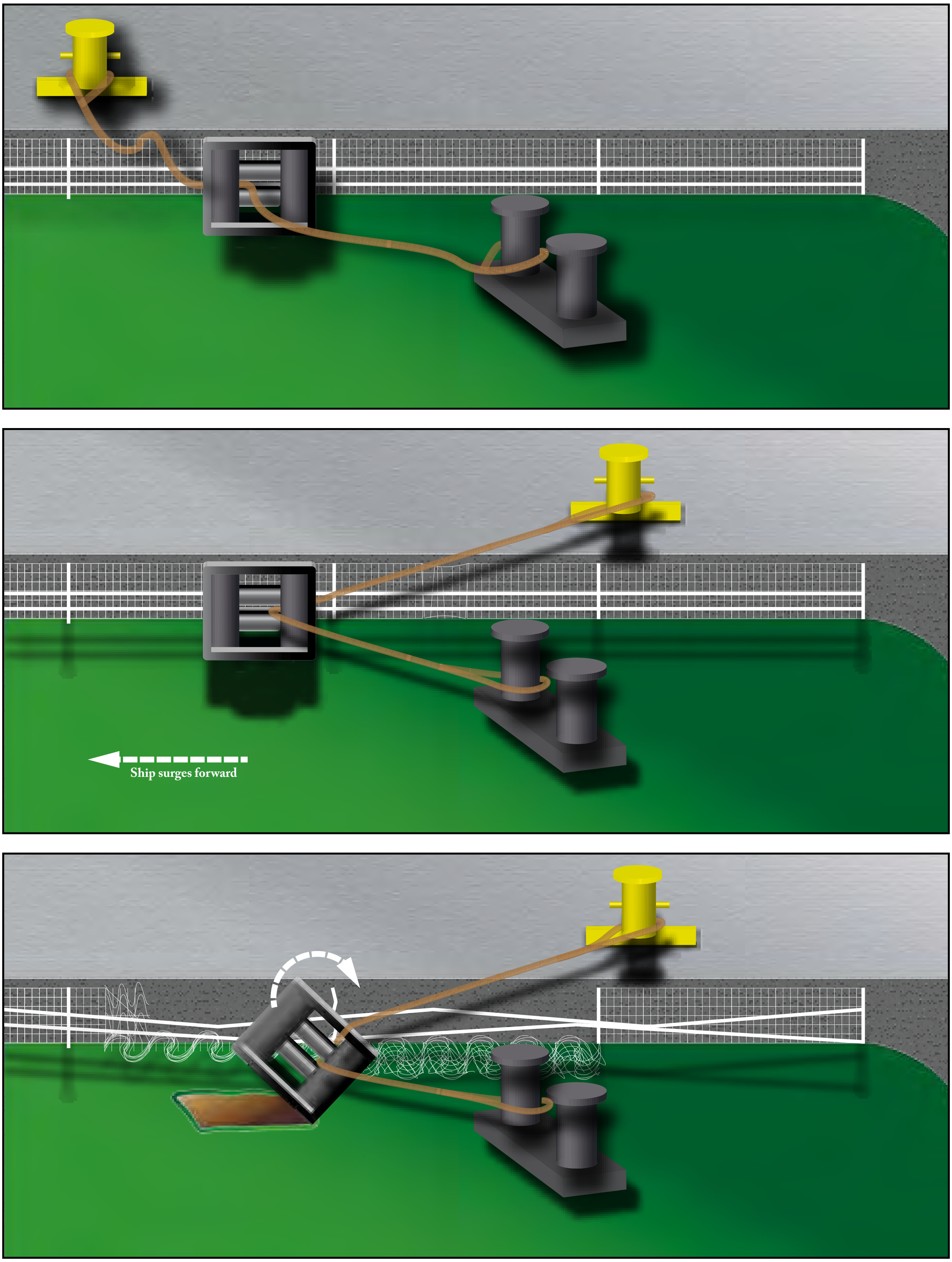


Figure 2: Sequence leading up to the accident (for illustrative purposes only - not to scale)

The Lessons

1. The problems caused by vessels surging on the quayside in exposed ports are well known and do occasionally lead to mooring lines parting. Masters should assess the suitability of a berth when considering the prevailing weather conditions, review their risk assessments, and establish a clear mooring plan that should include the disposition, size and types of ropes to be used.

2. The parting of a mooring line creates a significant hazard to a ship's crew; however, snapback paths can be predicted and safe zones identified. The failure of overloaded mooring equipment and the subsequent path of failed components is much less predictable and therefore potentially more lethal.

3. Vessel operators and crew should ensure that mooring line strength does not exceed that of the load limitation of installed mooring equipment such as deck bitts/bollards, rollers, fairleads and winches. It is recommended that ships' staff make themselves aware of load limitations of equipment and mooring ropes used before using a rope that deviates from that included in the design of the vessel.

4. The SWLs were not clearly marked on the vessel's mooring deck equipment. This made it difficult for the crew to understand the potential consequences of using stronger mooring lines.

5. The practice of putting soft eyes over mooring bollards or bitts on both ends of a mooring line is contrary to good seamanship practice as it makes it impossible for crew to slacken or release a taut line safely in an emergency.

Who Pulled the Plug Out?

Narrative

An anchor handling tug supply (AHTS) vessel was required to berth alongside for a routine dive inspection, so its master contacted a nearby port it visited regularly. The master requested a pilot and advised that the AHTS vessel's draught on arrival would be 6.7m. He also advised that an under keel clearance of at least 1m was required. The port's VTS informed the master that a pilot would embark at about 1100 the next day. As a result, the AHTS was anchored overnight.

At about 1000 the following morning, the VTS confirmed the pilot would be boarding at 1100 in a position 0.5nm from the port's entrance. The master manoeuvred the vessel towards the embarkation point, but at 1055 VTS advised him that the pilot was delayed by 1 hour due to other vessels' movements. The master stopped the AHTS in the water and used the vessel's dynamic positioning system to hold it in position.

The pilot eventually boarded at 1206. The information exchanged between the master and the pilot included the intended route, berth, and the vessel's draught and other characteristics. Tidal conditions were not discussed. It was now less than 1 hour to the predicted time of low water.

As soon as the master/pilot exchange was completed, the vessel proceeded towards the port entrance with the chief officer having the conn. On passing the entrance breakwater, starboard helm was used to turn the vessel into a turning basin. As the turn progressed, an unusual vibration was felt, which was quickly assessed by the bridge team to be due to debris in the water. The AHTS berthed without incident and the pilot disembarked.

Later, the divers conducting the planned underwater hull inspection saw that the vessel's skeg was damaged. The master was uncertain how this had occurred, and reported to the VTS the vibration felt during the inbound passage. Review of the vessel's position during entry, along with the height of tide, identified that the vessel had been on its intended track. However, it also identified that, because the inbound passage was 1 hour later than intended, and the height of tide was 0.4m less than predicted, insufficient water had been available. The vibration felt during the starboard turn resulted from the vessel taking the ground towards its stern. The damage to the skeg (see figure) required the AHTS to be dry docked for repairs.

The Lessons

1. Water depth can change dramatically with the tide, making some ports inaccessible at certain times. Therefore, when arriving or departing a port earlier or later than intended, confirming the height of tide and depth of water available, and re-checking the intended route, are smart moves.

2. Frequently, there is very little time for masters and pilots to discuss a lot of information. However, as the height of tide and the resulting water depths available along the track and alongside are fundamental to safe navigation, this information warrants being towards the top of the master/pilot exchange checklists.

3. Tides are not always as predicted, but most port authorities generally have real-time tidal information to hand. If this information is not provided as a matter of course through routine VHF broadcasts or exchanges, it is in everyone's interest to ask for it when meeting the required under keel clearance is marginal or in doubt.

Figure: Damage to skeg

Naked and Hot: Keep Hands Away

Narrative

The master of an offshore support vessel noticed that the starboard engine's exhaust temperature was higher than normal. He informed the engineer, who went down to the engine room to investigate. While approaching the engine, he lost his balance and steadied himself by placing both hands on an uninsulated section of the exhaust pipe, which was below his knee level (see figure). The engineer suffered severe burns to his hands and was soon landed ashore for treatment at a hospital. At the time of the accident, the sea was calm and the vessel was pushing on to a wind turbine platform.

The engines had a history of exhaust pipe cracking and the starboard engine exhaust pipe had been replaced 20 days before the accident, but its lagging had not been refitted. The vessel had a wet exhaust system and the exhaust pipe was raised above the sea level as a precaution against water flowing into a stopped engine.

Figure: Starboard engine exposed exhaust pipe

The Lessons

1. **Exposed surfaces with temperatures above 220°C are prohibited by SOLAS regulations as they are fire hazards.**
2. **If it is necessary to remove exhaust lagging for access, always ensure it is refitted as soon as the work has been completed.**

Mixing Doesn't Always Match

Narrative

A 20,000 gross tonnage cargo ship was unberthing with the aid of tugs. The tugs were each using a ship's line for towing. Each line passed through a panama fairlead and was secured to a set of mooring bitts.

As one of the tugs began to increase its pull, the applied load exceeded the SWL of the ship's structural mooring equipment. As a result, the mooring bitts failed along with the supporting structure for the panama fairlead. Consequential damage included buckled ship-side guardrails and bulwark.

The ship's crew noted that the SWL of the fairlead was 8 tonnes (t). They therefore took local action to highlight all mooring equipment rated at 8t, and instructed that this equipment was not to be used for towing, and included this information in pre-departure/arrival toolbox talks.

Several months later, the same ship was arriving in a different port, again using tugs. A tug was secured with a ship's line to a 32t SWL set of mooring bitts with the line running through a ship-side fairlead. As the tug moved to reposition itself, additional load came onto the towing line, resulting in failure of the mooring bitts (Figure 1).

Following the incident, the vessel successfully moored alongside. About 12 hours later the prevailing wind and swell in the harbour caused the ship to surge along the berth and the mooring lines to tighten on another set of bitts (rated at 15t), resulting in deformation and failure of the structure (Figure 2).

The ship was built in 1977 and retained the original mooring equipment, which had been maintained to Flag State and Class requirements throughout its life. The mooring lines had been changed through life as technology improved the characteristics of available products. The lines in use at the time of these incidents were high modulus polyethylene (HMPE). The manufacturer advertised this particular rope type as:

'a lightweight, high-strength, floating rope that can grip on a capstan or H-bitt. The patented technology provides superior abrasion and cut resistance, but with a higher coefficient of friction than other high modulus polyethylene ropes.'

Figure 1: Mooring bitts' failure during tug operation

Figure 2: Damage to mooring bitts following surging alongside berth

The Lessons

1. Following the initial mooring bitt failure, the ship's crew had identified that the SWL of the ship's line was higher than that of the bitts and fairlead. This prompted a review of the incident and a local change to procedures. The master advised the ship's technical superintendent of the incident and proposed upgrading the 8t bitts at a future refit.

2. Notwithstanding this, a review of the HMPE rope specification might have initiated an immediate review of the mooring system as a whole.

3. The HMPE ropes provided lightweight and easy to handle mooring lines. However, they were significantly stronger than previously used ropes (natural fibre, nylon, polypropylene etc.). Although the characteristics of the ropes had developed over time, the mooring equipment had remained the same.

4. All systems require an assessment of how individual parts interact with each other, and this is no different with mooring equipment.

What's That Noise?

Narrative

A ro-ro passenger ferry left its berth with 320 passengers, 72 crew and several cars and trucks on board. The planned manoeuvre was to clear the berth, increase speed, and steer a curved track, using port helm, to pass between the two breakwaters at the port's entrance. The master controlled the engine, thrusters and steering from the console on the port bridge wing (Figure 1).

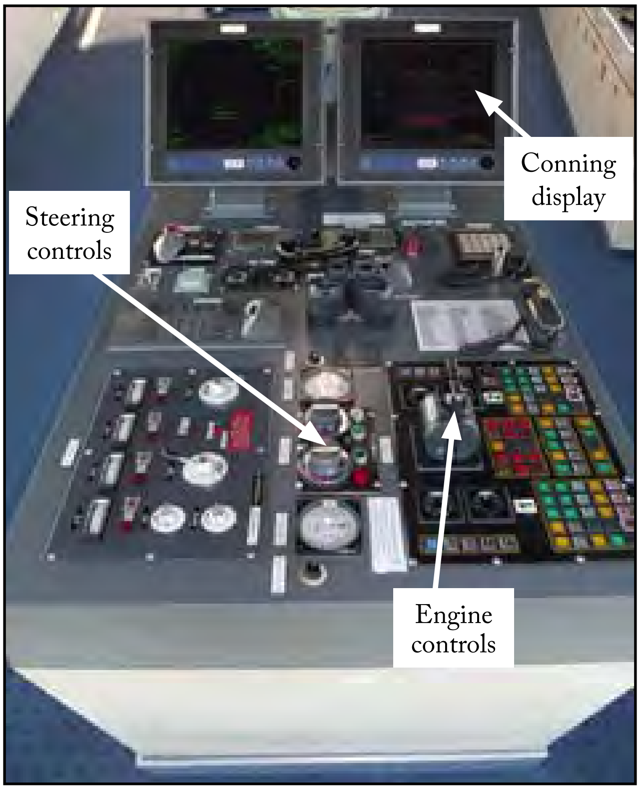


Figure 1: Port bridge wing console

The ferry cleared the berth on schedule in light winds on a hazy morning. About halfway into its turn towards the breakwater entrance the computerised steering mode changed unexpectedly from the port console to the trackpilot system. Immediately, the trackpilot applied starboard helm to arrest the swing and steer the course it was on when it activated. This was not immediately noticed by the bridge team.

While the rudders moved to starboard, the quartermaster heard a quiet and brief alarm from the centre control console (Figure 2), which alerted him to the steering mode change. He asked the master if the steering was still operating at the port console. In response, the master tried to apply more port helm using his control wheel, but there was no effect. He immediately ordered the quartermaster to change to manual steering, and the quartermaster changed the mode switch (Figure 2 inset) to 'main wheel' and applied full port helm. However, the master quickly realised that the vessel would not regain track to pass between the breakwaters and put the engines to full astern.

The ferry was 250 metres from the breakwater at 10kts when the engines went to full astern. The anchors were ordered to be let go and the quartermaster activated the remote releases on the bridge console. The speed reduced as the vessel continued to head for the breakwater, but it was not enough to prevent it hitting the concrete structure head on at about 3.5kts.

No-one else on board was aware of the emergency, and the collision caught everyone by surprise. The passengers and crew were thrown to the deck, loose items were scattered, and a few vehicles moved and were damaged on the vehicle decks. The ship's crew quickly mobilised to calm passengers and treat any injuries.

The ferry returned to the berth under its own power, where it was met by ambulances as 3 passengers and 10 crew had been injured. The ship was inspected by a classification society surveyor and port state officers, and was allowed to proceed to dry dock. The cause of the fault that changed the steering mode was never found. The vessel re-entered service 12 days after the accident.

The Lessons

1. The steering mode change alarm was relatively quiet, and sounded only on the centre console. Therefore it was not heard by the master, who had control of the helm. When the quartermaster heard the alarm and informed the master, the bridge team's lack of familiarity with the complex steering system did not allow them to quickly identify the problem and switch to a different steering mode in time to recover the situation.

2. A system to warn crew and passengers of a sudden stop should be available, tested, and used when required, to give passengers and crew a chance to brace themselves and thereby reduce the likelihood of them sustaining injures. An audible warning will also allow the crew to be better prepared for the aftermath if injuries or damage occurs.

3. Familiarity with critical systems is vital during an emergency, and knowing what the alarms indicate, and the appropriate corrective actions to take, can be the difference between a near miss and an accident.

4. Emergency planning should examine the 'what ifs' and encompass all aspects of the ship's operation. Table-top discussion is useful for this and it should be a forum for ideas. Don't limit critical systems' failures to open-water scenarios, but consider their effects when manoeuvring in harbour or in narrow channels.

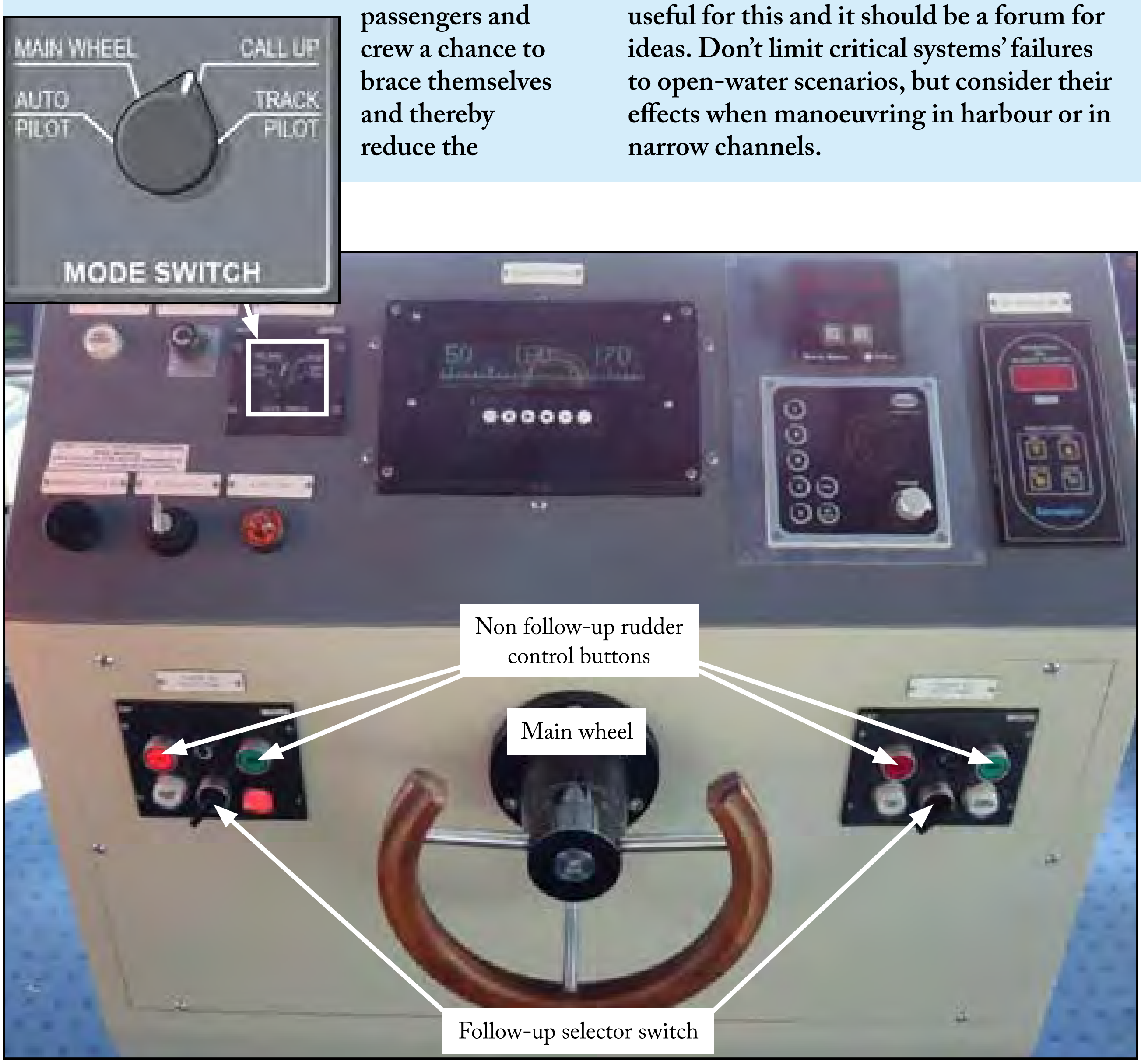


Figure 2: Main steering stand with mode control switch

Autonomous Mode Not Yet Engaged

Narrative

A small general cargo vessel grounded (see figure) when its bridge was left unattended. With its BNWAS[1] system switched off there was no way to alert anyone on board that anything was amiss.

The master had taken over the navigational watch from the chief officer. Although the watch bill required a lookout to be posted during the hours of darkness, in practice this was not done, so the master was the sole watchkeeper.

The master altered course to avoid another vessel and then set the autopilot to regain the planned track. He then left the bridge, ostensibly to go to the toilet, but did not return. Two hours later the cargo vessel grounded.

The grounding woke the crew, who then mustered on the bridge. The chief officer noted that the master appeared incapacitated, and took command of the vessel on the company's instructions. After a check of the hull integrity, the chief officer was able to refloat the vessel and it continued to its discharge port.

A survey at the discharge port revealed that the vessel had extensive damage and it was removed from service for several months.

Figure: Vessel aground

[1] Bridge Navigational Watch Alarm System

The Lessons

1. The chief officer had previously spoken to the master about his excessive drinking and had urged him to stop. On handing over the watch, the chief officer had smelled alcohol on the master's breath but had assessed him as being fit for duty. Consuming alcohol shortly before taking over the watch is dangerous. Alcohol consumption can lead to drowsiness, inattention, and it can significantly impair performance. It is essential that OOWs are fit for duty. This means they need to be rested and free from any impediment.

2. It can be extremely difficult to raise concerns - such as excessive drinking - with senior personnel or a company representative, especially if the issue relates to one of your crewmates, and particularly one of higher seniority. However, it is vital that something is said to the right person before the situation has a chance to escalate and place the crew, ship and cargo in peril. A robustly enforced drugs and alcohol policy, with equipment provided on board for routine testing can help.

3. Most ships' bridges are awash with electronic equipment all designed to assist in the safe navigation of the vessel. However, to gain advantage, the equipment must be operational and switched on. In this case, had the BNWAS been switched on there would have been enough time for it to alert others on board that the bridge was unattended.

4. A watchbill takes into consideration the required manning levels for a variety of operational circumstances. Had a lookout been posted on the bridge, this accident could have been averted.

A Matter of Thrust…

Narrative

While alongside in a river port, starboard side to and head to stream, a 62m offshore supply vessel was shifting berth 100m astern. It was a routine manoeuvre and the main engine, steering, and bow and stern thrusters were available.

After letting go the forward lines, the master noticed that neither of the thrusters were operating. As a result, the bow was quickly set towards the middle of the river by the stream (Figure 1). The river was only 75m wide, and with the stern lines and aft spring still connected the master was unable to control the vessel with only the main engine. As a result, the stern lines tensioned and started to run off the bitts (Figure 2), prompting the aft mooring team to take shelter.

Meanwhile, the shore linesmen managed to let go the aft spring. Although the deck crew tried to recover the spring inboard, there was a lot of line in the water and they could not prevent it from fouling the starboard propeller. By that time, the supply vessel was very close to berths on the opposite bank and, although stern lines remained connected, the master had managed to keep the vessel head-to-stream. However, he could not prevent it from colliding with two small moored boats (Figure 3). Soon after, the thrusters were started and the master was able to manoeuvre the supply vessel back alongside its original berth. The two small boats sank.


Figure 1

Before the vessel started to slip, the master had checked the thrusters were working by observing pitch movement. However, technical investigation indicated that the thrusters' electric motors were probably not started.


Figure 2

Figure 3

The Lessons

1. The indication of pitch movement on electro-hydraulic thrusters shows only that the hydraulics are moving the propeller blades. It does not indicate that the thruster is turning. This is best achieved through physical tests with wash, the movement of mooring lines and thruster noise providing the most positive assurances.

2. No matter how routine shifting berth might seem, the number of parties involved and the level of co-ordination required increases the potential for something to go wrong. To prevent this from happening, toolbox talks are a useful means of ensuring that everyone is aware of the task, the plan, the sequence of events, the crew and equipment required and the status of machinery. They can also be used to highlight risk factors such as tidal streams and snap-back zones.

3. Each year, a number of seafarers are killed or seriously injured during mooring operations. However, although many occasions arise in which tensioning of mooring lines is unexpected and cannot be controlled, the fallback options of keeping out of snap-back zones and taking cover are tried and tested and are nearly always available.

Location, Location, Location

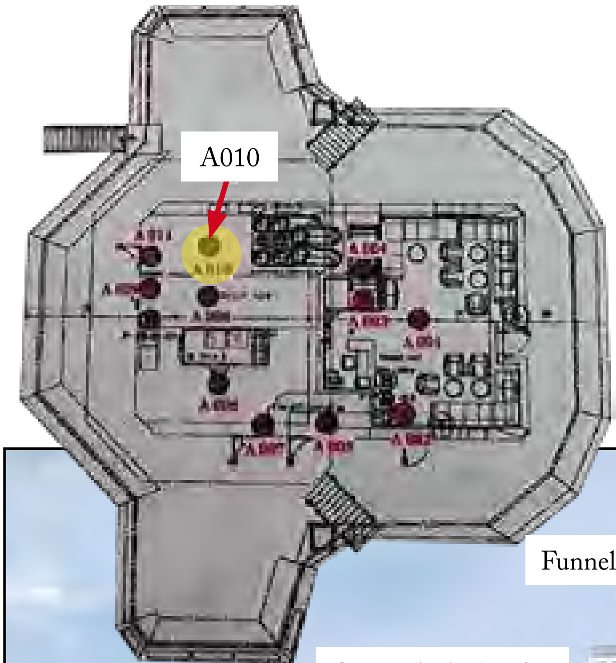
Narrative

The bridge fire panel alarm sounded on board a support vessel that was on passage through the North Sea. This indicated a fire in Zone 1, sensor 'A010' – the captain's deck office, immediately below the bridge. The OOW acknowledged the alarm and informed the master.

The master quickly checked the deck office and the adjacent compartments, and finding no sign of a fire confirmed that the fire sensor number did not match the one displayed on the bridge panel. The master then came to the bridge and checked the Fire Detector List, which stated that sensor A010 was in the sky lobby, located immediately above the bridge (Figure 1). Again, a quick inspection of that compartment also revealed no sign of a fire. Returning to the bridge the master and second officer reset the alarm, which immediately reactivated. They then checked the location of sensor A010 on the Fire Safety Plan (Figure 1 inset) and noted that it was located in the funnel casing.

The master, accompanied by the chief officer and chief engineer, went to inspect the funnel. When they arrived, they noticed smoke escaping from a fire damper, and on opening the funnel door saw dense smoke and sparks within.

The ship immediately went to emergency stations and diverted to anchor to allow the propulsion system to be shut down. When the ship's teams, wearing fire suits and breathing apparatus, entered the funnel, they found that the source of the smoke was an exhaust gas leak from a loose flange. The sparks had been caused by the hot exhaust gas charring the funnel insulation material (Figure 2).



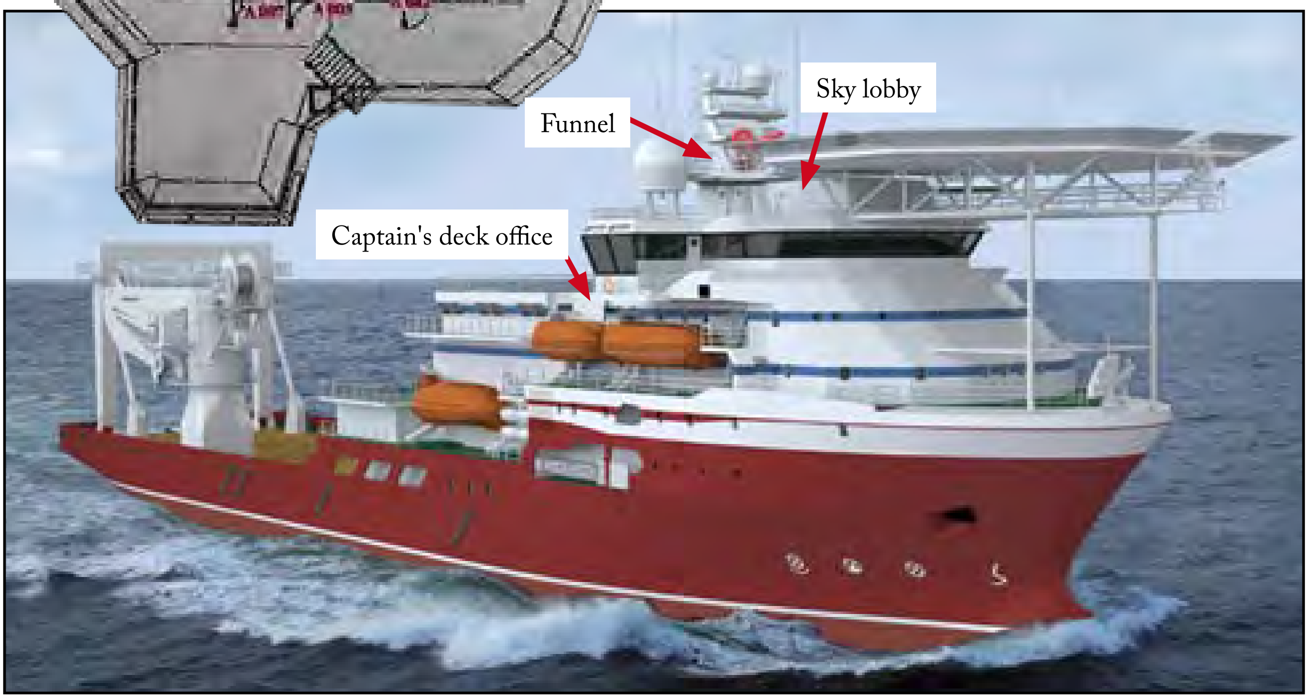


Figure 1: Approximate locations of the sky lobby, the captain's deck office and the funnel (inset: fire safety plan, highlighting the location of sensor A010)

Figure 2: Damaged area of exhaust lagging

The Lessons

1. The safe operation of large, modern vessels relies on automatic fire detection systems to quickly alert the crew so that they can take prompt and effective action to extinguish a fire before it takes hold. However, in this case, the wrong location on the bridge alarm panel resulted in a 20-minute delay. Thankfully, it was merely an exhaust gas leak. Had it been a serious fire, the delay in fighting it - with either fixed or portable fire-fighting systems - could have placed the safety of the vessel and the lives of those on board at serious risk.

2. Routine inspection of onboard fire-fighting equipment is part of life at sea, and periodic checks of the ship's fire detection system are central to this process. However, as this case reveals, checking that the fire sensors alarm is only one aspect of the test; the crew should also confirm that the location is accurately displayed and recorded. In this instance, the ship was 6 years old, and it is highly likely that the location of fire sensor A010 had been incorrectly recorded since build. The company has directed its fleet to amend its planned maintenance systems to ensure that fire sensor checks include confirmation that the correct location is displayed on both the bridge panel and supporting system paperwork.

Loss of Fingers

Narrative

The multi-national crew of a large, modern, cargo vessel had undertaken a lifeboat drill while alongside in port. They were in the process of recovering the lifeboat when a deck cadet's fingers became caught under the fall wire, which resulted in two of his fingers being traumatically amputated.

The cadet was given immediate first-aid on board, then taken ashore to the local hospital for emergency treatment before being repatriated home a few days later to recover.

The regular launching and recovery of the ship's lifeboats formed part of the ship's training schedule. As the ship was alongside for the afternoon, permission was obtained from the port authority to launch the ship's starboard lifeboat to the water.

The chief officer gave the team involved a safety brief and toolbox talk about the lifeboat drill, and his intention for the crew to grease the fall wires afterwards. Four crew members then embarked into a service boat that was brought alongside the quay, and two tins of grease with greasing rollers were brought to the boat deck by another crewman.

Under the command of the chief officer, the bosun lowered the empty lifeboat to the water. The four crew members boarded the lifeboat from the service boat and completed in-water running tests. Because of a slight swell in the harbour, it was decided not to take the lifeboat away from the ship's side. When the tests were complete, the crew made the lifeboat ready for hoisting and disembarked into the service boat.

Once the lifeboat was ready, the chief officer gave the order and the bosun started to hoist the lifeboat using the electric motor. Unnoticed by the bosun, the cadet stepped forward to grease the fall wire by letting it run through his hand close to the winch drum (Figure 1) as the boat was being heaved up. Without warning the cadet's hand became stuck to the wire and his fingers became trapped under it as it was being wound onto the drum. Because his hand was so close to the drum, his warning shouts did not give the bosun enough time to stop the hoist motor before his fingers were trapped and traumatically amputated (Figure 2) between the wire and the drum.

Figure 1: Winch drum

Figure 2: The amputated fingers

The Lessons

1. It is essential that seafarers are familiar with the life-saving systems on board their ships and that they perform regular drills. Abandon ship drills should be planned, organized and carried out so that the recognized risks are minimized. In this case, the lifeboat drill followed correct procedures: the boat was lowered empty, before a dynamic risk assessment identified that taking it off the hooks when it was in the water would introduce an unnecessary hazard. The benefits of taking a moment to re-assess site safety cannot be overstated.

2. Although most wire rope is supplied to ships pre-lubricated, protecting exposed wire rope is a necessary part of the maintenance procedure to prolong its life. Greasing a wire by running it through someone's hands can be very dangerous, particularly if the grease is old, cold, thick and sticky; and gloves and skin can be caught on a broken wire. Greasing a moving wire should only be undertaken with great care after thorough risk assessment, and by using a brush, spatula or an automated lubrication system. Not, as in this case, by hand.

3. There were two tasks being undertaken. First, the lifeboat drill, and second, the greasing of the wires. Because the toolbox talk included them together, the cadet was unclear when to undertake the greasing task. Great care must be taken to ensure all participants fully understand their role, particularly on vessels with mixed nationalities. Trainees and less experienced crew require closer supervision and help. Toolbox talks must be short, simple and focused on one subject at a time.

Keep the Fire in the Furnace

Narrative

A motorman was killed and a second engineer seriously injured when a boiler furnace explosion occurred on board a large container vessel during a berthing operation. The explosion caused serious damage to the boiler and started a small engine room fire that was extinguished by the ship's crew.

The vessel, which normally operated on heavy fuel oil, had recently entered a sulphur emission control area, and its main engine and auxiliary systems had been reconfigured to operate on low sulphur marine gas oil (MGO). Since the change-over, the vessel's auxiliary boiler had suffered a series of flame failures and boiler shutdowns. On each occasion, the engineers investigated and re-started the boiler.

As the vessel entered the port, the boiler suffered another flame failure and shutdown. The second engineer investigated and made several attempts to re-start the boiler in its automatic mode. The duty motorman saw the second engineer at the boiler control panel and went to assist. The second engineer then switched the boiler controls from automatic to manual mode and again attempted a restart. When he looked through the boiler sight glass he saw a glow in the furnace and realised something was wrong. As he headed back to the control panel to stop the boiler an explosion occurred in the furnace.

The force of the explosion blew the burner unit off the front of the boiler (Figure 1) and released a fire ball. The motorman was standing directly in front of the burner unit and took the brunt of the explosion. The second engineer was caught in the fire ball, but was able to raise the alarm and attempted to revive the motorman. As the vessel was alongside, shoreside medical teams were quickly on the scene, but they were unable to save the motorman.

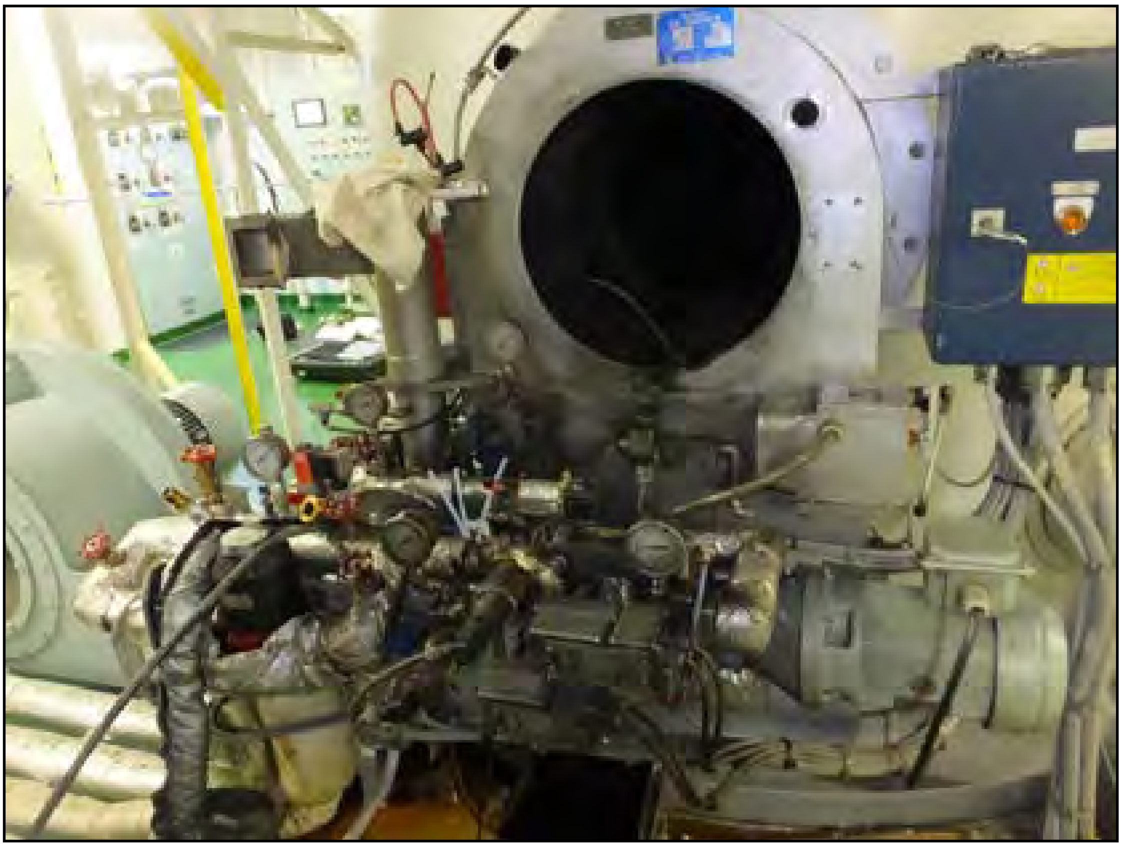


Figure 1: The damaged boiler

The Lessons

1. During the second engineer's attempts to restart the boiler, dangerous levels of fuel were allowed to build up in the furnace. Once the fuel vapour/air mixture levels were within the explosive limits, any source of ignition would have caused the catastrophic explosion. It is therefore imperative that the boiler manufacturer's operating instructions are followed at all times. In particular, all fuel vapours must be thoroughly purged from furnaces following any burner or ignition failures, and prior to firing up a boiler.

2. Subsequent inspection of the boiler's fuel system found that a supply filter was blocked with waxy sludge deposits (Figure 2). A poor fuel supply would have led to the intermittent operation of the boiler burner unit and its failure to re-start. The constant re-setting of machinery following a fault alarm, without determining the cause, risks unintended and unexpected consequences. Don't bypass important checks when a fault occurs.

3. Analysis of the low sulphur fuel in use identified it as a summer grade MGO with a Cold Filter Plugging Point (CFPP) temperature of 14°C, indicating that the fuel could become waxy and block filters at 14°C and below. The external ambient air temperature was 4°C, and 9°C in the vicinity of the boiler. Although the fuel had met the international standard test criteria at the time of bunkering, its CFPP was not assessed. Ensuring fuel is suitable for all expected operating conditions in which the vessel may operate is critical to its safe use.

Figure 2: Waxy deposits in fuel line filter

Anchors Aweigh, and so is the Tow

Narrative

A 25m tug was towing a large unmanned semi-floating drill barge in the Baltic Sea. Owing to deteriorating weather conditions the tug's master decided to anchor the tug overnight in a sheltered anchorage with the intention of continuing on passage the next day once the weather improved.

The tug was anchored 1.4nm offshore in 12m of water, with 5 shackles of anchor cable deployed. The towing wire between the tug and the barge was shortened to 50m.

At 0115 the watchkeeper called the master to the bridge because he was worried that the vessel was dragging anchor. The master noted that the wind had veered, so he spent a period of time on the bridge until he was satisfied that the anchor was holding in the new wind direction.

At 0345 the watchkeeper again alerted the master that the anchor may be dragging. When the master arrived on the bridge he noted that the wind direction had again shifted, and had increased to force 6. Sea conditions had worsened. The tug's engines were started and preparations made to commence heaving the anchor.

At 0420, a loud bang was heard while the anchor was being heaved; the towing wire connecting the tug to the barge had parted (Figure 1). The barge began drifting towards the shore at a speed of 1.7kts. After weighing anchor, the tug's crew tried to pick up the emergency towing line that was rigged on the barge, but without success. The barge grounded as it approached the shore (Figure 2).

Salvors successfully refloated the barge 3 days later.

Figure 1: The broken towing wire

The towing wire

1. **The towing wire failed as the tug's anchor was being heaved. The tow line failed in the vicinity of the hard socket on the eye of the towing wire. Subsequent destructive testing of the towing wire showed that it parted at a significantly lower load than expected. The towing wire had a certified minimum breaking load of 102.95t; during testing it began to fail at 64t and parted at 87.74t.**
2. **An inspection of the towing wire identified that the wire was rusty, and flat spots and areas of wear were identified. However, the towing wire was 7 years old and had been inspected regularly by the ship's master as required by the company safety management system. No defects or damage had been recorded.**

Figure 2: The grounded barge

The Lessons

1. The decision to go to anchor was prudent. However, when selecting any anchorage, care must be taken to ensure that there is sufficient sea room to allow time to deal with any unexpected circumstances. A full appraisal of the weather forecast should be taken prior to choosing an anchorage, and all of the risks assessed to include the possibility of worse than forecast conditions.

2. An emergency towing arrangement was fitted onto the barge, but due to the design of the barge and the structures on it, access from the tug to the emergency towing arrangement was difficult. Emergency towing equipment must be rigged in such a way that it remains accessible at all times.

3. Competent persons tasked with the inspection of towing wires must ensure that a thorough inspection of the wire rope takes place, and, if defects are found, that the rope is removed from service. Appropriate advice on maintaining towing wires is provided in MGN 308(M+F) Mooring, Towing or hauling equipment on all vessels – safe installation and safe operation, and in the Code of Safe Working Practices for Merchant Seafarers (COSWP).

4. Wire hidden within a hard socket cannot be visually inspected. Companies should therefore include a time frame for replacement of the towing wire eye hard socket within their operating procedures.

Don't Drive When Tired

Narrative

The 110 passengers and four crew on board a high-speed passenger ferry escaped serious injury when the ferry struck a landing pontoon at speed.

The ferry was providing a regular passenger/commuter service on a busy waterway and was on its third run of the day. The skipper was feeling tired and finding it difficult to remain alert. He had started work on board at 0500 after finishing a night shift in a land-based occupation. At the previous stop, the skipper had sat back in his chair, closed his eyes and fallen asleep for a few moments until woken by the VHF radio. He then readied himself, manoeuvred the ferry off the berth and increased the ferry's speed to 29kts.

About 4 minutes later, the skipper reduced the ferry's speed to 12kts as it approached the next stop. He then sat back in his chair and closed his eyes. Moments later, the skipper awoke with a start to find the ferry heading straight for a pontoon only 50m ahead. He immediately set full thrust astern and attempted to turn the ferry, but a heavy landing could not be avoided.

The ferry struck the pontoon (Figure 1). Most of the passengers and crew were seated at the time of the impact, but those who were standing were thrown forward, with two passengers and two crew suffering minor injuries. Damage to the ferry's port bow above the waterline (Figure 2) required it to be taken out of service for repair.

Figure 1: Damage to pontoon

Figure 2: Damage to bow of ferry

The Lessons

1. Tiredness and fatigue are phenomena to which all humans are prone; no one is exempt. Burning candles at both ends is not a sensible preparation for a bridge watch. Looking after yourself, particularly if you have a responsibility to look after the safety of others, is a must.

2. Almost every bridge watchkeeper will have experienced the 'rubber neck' syndrome when they have been on the verge of falling off to sleep, either through fatigue or boredom. There are many things that can be done to help prevent this from happening, such as standing up, moving around, getting some fresh air and turning down the heating. However, if these don't work, another watchkeeper should be called either to assist or to take over.

3. On many short commuter ferry crossings and river trips, many passengers are desperately keen to disembark as soon as possible, and ignore crew advice to remain seated until the vessel is alongside. Not insisting that everyone must remain seated is fine - until something goes wrong. The consequences then can be significant.

You Were Only Supposed to Blow the Doors Off

Narrative

The loading instructions received by the master of a cargo vessel were unambiguous: 'proceed to port for a full load of incinerator bottom ash (IBA). This is a non-hazardous cargo. It can be loaded in rain.'

The master checked the schedule of authorised bulk cargoes in the International Maritime Solid Bulk Cargoes (IMSBC) Code (Figure 1) but found no entry for IBA. Based on the assurance received from the shipper in the loading instructions, he loaded around 2300 tonnes of unprocessed IBA in heavy rain. The vessel left the berth in the evening and the master decided to drop anchor just outside the port to wait for bad weather to pass.

Figure 1: IMSBC Code

The following day, the chief engineer went into the forecastle store to test the emergency fire pump. He ran it for 5 minutes, and when he switched it off there were two loud explosions in rapid succession. The chief engineer was blown off his feet by the explosions, the waterproof coat he was wearing was melted (Figure 2) onto his skin and he suffered severe burns to his head and body. He staggered out of the store and a crew member assisted him to the mess room. He was subsequently evacuated to hospital by a rescue helicopter. The chief engineer had suffered first degree burns to his face and second degree burns to his body, both hands and lower extremities. His recovery took several months.

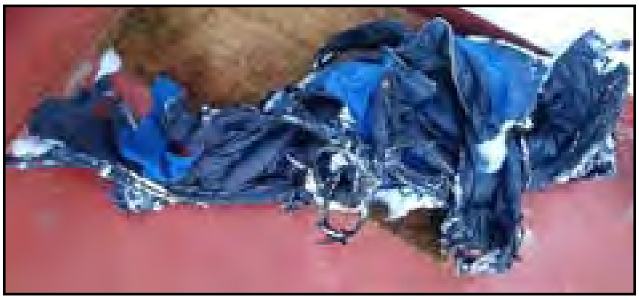


Figure 2: The chief engineer's burnt waterproof coat

The explosions had lifted all of the vessel's heavy steel hatch covers, breaking their holding down cleats (Figure 3). Many of the hatch covers had also been distorted and some had fallen into the cargo hold and were resting on top of the cargo. The cargo hold coamings had also been distorted; the vessel was out of service for 4 months for repair.

An investigation into this accident revealed that hydrogen gas had been released from the cargo and had seeped into the forecastle store through a cargo lamp access plate (Figure 3). At some point the access plate had been loosely refitted with two bolts and no sealing gasket. Hydrogen gas, which forms an explosive mixture with air from 5% to 74% concentration, ignited when the emergency fire pump was switched off - probably because of some arcing between the electrical contractors in the starter box.

Figure 3: Damage caused by the explosion and the location of the cargo lamp access plate

The Lessons

1. It is illegal to load a cargo that has not been included in the schedule of authorised cargoes in the IMSBC Code. If you are asked to load a cargo that has not been included in the Code, alert the competent authorities in the port and refuse to load it.

2. Always ensure that the gas tight integrity of cargo holds is maintained.

Part 2 - Fishing Vessels

I have been directly involved in fishing my whole life, watching the boats coming in through the pier ends to discharge their catch to the fish market, hearing the camaraderie of the deck crews vying for the position of 'top boat', smelling the fresh fish being auctioned off beneath the feet of the auctioneer. These are the sights and sounds I remember from my youth growing up in Whitby, a small seaside fishing community in the North East of England.

Being involved in the fishing industry gives me a sense of pride, I can work in an industry where hard work, ingenuity and, often, just a dogged determination to succeed, pays rewards.

Throughout my career I have witnessed many changes within the fishing sector, arguably the most influential is the introduction of the SeaFish four mandatory basics safety courses, where no fisherman, either trainee or experienced, can legally sail on any vessel regardless of its length or capacity without first having completed these statutory training courses. I believe this was the kick start the industry needed to educate fishers into the ideas and practices surrounding safety at sea.

The people I have met throughout my career have one aim, for the crew and vessel to leave the harbour and return safely at the end of each trip.

Coming from Whitby and now operating from Peterhead Scotland has highlighted to me a situation affecting many fishers - fishermen follow the fish. As a result many fishers have become nomadic, landing in unfamiliar ports and living aboard the vessel. There have been too many injuries and fatalities resulting from a run ashore. Leaving and returning to the vessel always poses a risk factor, and that risk is elevated with the situation: is it dark, wet or icy, are there any trip hazards? The factors are numerous, and all add to the risk.

In my company we actively promote safe working practices and crew training.

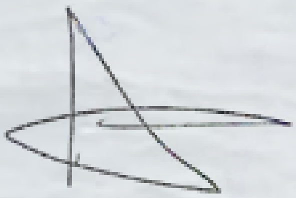
A few examples are

- All the crew always wear a PFD when on board the vessel unless the risk assessment has been done and the use of PFD's is not recommended- such as processing the catch under the shelter deck.
- The engineers have undertaken the Approved Engineer Course (AEC).
- Any crew member who takes a wheelhouse watch has completed some form of watchkeeping training.
- The skippers and crews have acted out numerous risk assessments on various tasks undertaken both on and off the boat.

This does not exempt my vessels and crews from harm, but I believe it has the possibility of averting a potential accident.

Sadly, the latest edition of the MAIB Safety Digest tells us of the darker side of the fishing industry. An occupation fraught with danger where the slightest miscalculation or lapse in concentration can lead to a casualty or even a fatality. This edition highlights situations both on and off the vessel and not just associated to fishing activities.

I hold a deep respect for the MAIB, and the Safety Digest is an important read for vessel owners, skippers and crews operating within the fishing industry.



ANDREW LOCKER
Andrew was born and educated in Whitby. He completed a mechanical apprenticeship at Cleveland Potash limited then went to sea as trainee deck hand on MFV Ocean Way. Working his way up to the wheel house his first command was Whitby registered trawler Jaqueline Louise. Andrew continued as skipper of numerous vessels, most recently Aurelia BF15.

Andrew is currently a director of Lockers Trawlers LTD, Lockers Fish LTD and Managing Director of guard vessel company Offshore Marine Energy Services Limited (OMESL) and chairman of East of England PO.

CASE 16

Get Home Safely

Narrative

When starting work one morning, the crew of a fishing vessel that was berthed outboard of another vessel alongside in harbour, discovered that one of the deckhands was missing. Following an extensive search, his body was discovered under an adjacent fishing vessel.

Late the previous evening, the skipper of a nearby vessel had escorted the deckhand back to the vessel. The boarding arrangements were far from ideal, so the skipper watched while the deckhand boarded the inboard vessel, crossed its deck, and then climbed on board his own vessel. The deckhand was last observed as he passed out of sight behind the wheelhouse.

When the deckhand's body was recovered, two of his fly buttons were undone. The postmortem examination found a large quantity of urine in his bladder and a high level of alcohol, which would have adversely affected his coordination, reaction time and perception of risk.

The investigation concluded that the deckhand was attempting to urinate over the side when he slipped or over-balanced and fell into the harbour. Thereafter he was unable to get himself out of the water. Although another crewman was in the wheelhouse at the time, he was absorbed making a phone call, and had not noticed his colleague boarding the vessel.

The Lessons

1. **Between 1994 and 2016, there were 24 fatal accidents involving fishermen boarding UK fishing vessels. Alcohol consumption was identified as a contributing factor in 17 of those accidents. While limited alcohol consumption may be acceptable in port, the high number of fatalities resulting from fishermen falling overboard while returning to their vessels under the influence of alcohol demonstrates a need for the fishing industry and port authorities to work together to address this issue.**

2. **Living on board fishing vessels places additional safety and social responsibilities on the owner, and a consequent need to address all additional associated risks, including alcohol consumption. Risk assessments should cover all activities of the crew, including going ashore or returning on board from recreational pursuits. Fishermen have their own part to play in minimising risks to themselves, and this includes limiting their alcohol consumption. Even so, adopting an appropriate, formal alcohol policy in port can help emphasise this responsibility and so help ensure the safety and well-being of crew living on board.**

3. **Monitoring movement of crew on and off a vessel can be easily achieved and ensure that someone is on hand to assist or raise the alarm in a timely manner in the event of an accident. In addition to assigning a dedicated crew member to remain on board for this purpose, 'buddy' systems provide an additional means for crew members to watch out for each other when returning together after an evening ashore.**

That Sinking Feeling

Narrative

A trawler was towing its nets when they became snagged on a seabed obstruction. After freeing them, the skipper decided to recover all the gear to check it. As the gear was being recovered, the port trawl door struck the hull heavily; this was almost immediately followed by an engine room bilge alarm.

The crew discovered that the flood was in the vessel's aft compartment and floodwater was entering the engine room via the drain valve between the two compartments. The crew could not stop the flooding as the lower part of the aft compartment was inaccessible, and there was also no fixed bilge suction in the flooding space.

The crew attempted to control the flood using the fixed bilge pumps in the engine room and portable submersible pumps via the accommodation space escape hatch. The engine room bilge pumps became ineffective as the flood took hold and a bow up trim was adopted. The portable pumps were also susceptible to blockages by debris. As a result, the flood could not be brought under control and the vessel was lost when the escape hatch submerged, causing overwhelming flooding.

Figure: Final sighting of the vessel

All of the vessel's four crew members and two lifeboat crew members, who had embarked to assist with the pumping effort, ended up in the sea as the vessel sank (see figure), but fortunately all were rescued safely onto the lifeboat.

The Lessons

1. **Flooding presents an immediate threat to a vessel – it should be considered as serious as a fire. As soon as flooding is detected, every effort should be made to stem or contain the floodwater ahead of other considerations.**

2. **Always be prepared for any emergency. Conducting crew drills and checking that emergency equipment is in good working order will build crew confidence when a real emergency unfolds. Get together as a crew and think through the actions to take to deal effectively with such serious emergencies. Although this vessel could not be saved, the crew deployed their portable emergency pump and embarked a second pump to assist with the effort to bring the flooding under control.**

3. **As well as tackling the flood, it is important to consider the vessel's stability situation. In this case, post-accident analysis showed that, during the emergency, there was a serious risk of the vessel capsizing. This did not happen as the sea conditions were relatively calm. However, as a lifeboat and rescue helicopter were on scene, it might have been more appropriate to abandon the vessel earlier. This would probably also have prevented anyone entering the cold seawater.**

Bigger Fish Could End Up Fried

Narrative

A large (24m) scallop dredger was trawling on fishing grounds off the east coast of England. The boat was based in the south-west, but had relocated to fish in a more productive area. After several successful trawls, three of the dredges became entangled in a submarine cable.

The skipper was initially unable to free the vessel from the cable and requested assistance from the coastguard. An all-weather lifeboat was launched and stood by the fishing vessel to provide safety cover while the skipper continued his efforts to free the vessel.

The coastguard sought advice from the cable owner/operator, who was able to confirm that it was a communications cable. Nonetheless, their advice was to slip the dredging gear to avoid risk to the crew and any additional damage to the cable. However, the skipper chose to continue his attempts to free his gear. He decided to wait for low tide and then attempt to get the cable alongside to free it. During the recovery efforts, the gear broke away, with the loss of three scallop dredges, and the cable fell back to the seabed.

The fishing vessel was able to return to its home port with no damage other than the loss of the three dredges. Damage to the cable resulted in a loss of communications and considerable costs to identify and repair damage. The cable was one of a number recorded on nautical charts covering the area. It had been laid a number of years earlier following consultation with the local fishing federations and financial compensation to the affected fishing communities.

The Lessons

1. **The submarine cables were marked on the chart, which carried a warning not to anchor or trawl in the vicinity of the cables. However, although aware of the cables, the skipper assumed that they would be buried such that he could continue to fish despite the warnings. His actions resulted in damage to UK infrastructure and the loss of fishing equipment. All fishermen must be aware of the hazards relating to their operations, heed notices and warnings, and take appropriate action to avoid risk.**

2. **If the dredges had become entangled in a submarine power cable, disregarding advice from the cable operator could have put the lives of the crew attempting to free the gear in extreme danger.**

3. **In addition to the information displayed on admiralty charts, an interactive map of the UK's offshore cable routes can be found at the following web address:**

   http://www.kis-orca.eu/map#.Wzyqa9JKjIU.

   Make sure you know where they are, and keep clear.

Going, Going, Gone

Narrative

A 7.2m potter (Figure 1) with a skipper and crewman on board was returning to harbour after a day's fishing for whelks. The sea conditions were slight, but it became increasingly rough as the boat approached a bar; this was not uncommon.

As the boat passed over the bar, the crew experienced an unexpected roll to starboard; the boat then righted itself before rolling heavily again. Hearing the bilge alarm and concerned about capsize, the skipper grabbed two lifejackets from the wheelhouse and these were donned by both crew as the boat rolled over.

The boat settled on its side and both crew managed to scramble onto the side of the wheelhouse. The skipper raised the alarm by calling 999 on his mobile phone and getting through to the coastguard. Although the skipper was not able to pass a precise position, the information he gave was sufficient for a successful search and rescue mission. The fishing boat sank prior to the arrival of the lifeboat, leaving both men in the water clinging to a lifebuoy (Figure 2).

Figure 1: The boat

Figure 2: RNLI rescue

The Lessons

1. Be prepared for every eventuality, including flooding, which presents an immediate risk to any vessel; systems and procedures should be in place to minimize the risk of loss. The source of flooding in this accident was never found; however, it was sufficiently rapid to cause the boat to become unstable and capsize before the crew could react. Although the bilge alarm was heard before the boat capsized, it did not provide sufficient warning and the boat's bilge pump did not cope. Consideration should be given to the location of bilge alarm switches and to the capacity and operating modes of pumps.

2. Wearing a lifejacket is critical to survival when unexpectedly immersed in cold water. Neither of the boat's crew routinely wore lifejackets when working on deck. It was extremely fortunate that they were able to don lifejackets as the boat got into difficulty and they found themselves in the sea. Both crew were extremely cold when rescued, and their survival probably depended on the lifejackets and lifebuoy.

   An even better option would have been to carry a liferaft, which could have provided them with shelter until help arrived.

3. Being able to raise the alarm is vital for rescue to follow. The skipper was able to report the emergency using his mobile phone and provide sufficient information for a successful rescue. However, had his phone not worked, there would not have been any method of raising the alarm because the boat's electrical systems cut out when the flooding happened, thus preventing the use of the VHF radio. Furthermore, it was not fitted with an EPIRB and the crew carried no personal locator beacons.

   The carriage of an EPIRB is a simple and effective way to raise the alarm in an emergency of this nature and will become mandatory with the introduction of The Code of Practice for the Safety of Small Fishing Vessels of less than 15m Length Overall. But why wait?

No Alarm, No Alert, No Chance

Narrative

A fishing vessel skipper decided to anchor overnight as the crew were exhausted after several long days of fishing. The skipper anchored the boat in a sheltered bay close to a beach. Once at anchor, the crew hosed down the working deck and ate a meal before going to bed. In the early hours of the morning, all four fishermen were woken as the boat was sinking rapidly by the bow.


Figure: The uninflated liferaft

The skipper and crew were able to escape out of the accommodation and don foam-filled lifejackets. They activated the EPIRB and prepared to launch the liferaft but, despite their efforts, it would not inflate. To give the liferaft some buoyancy, the crew put fishing marker buoys inside the canopy before lowering it into the water (see figure).

The skipper and crew entered the water and attempted to support themselves on the uninflated liferaft. One of the crew managed to survive by swimming to the shore, but tragically none of the other three crew survived.

The Lessons

1. With crew on board and no one on watch, vessels must be in a safe condition. This accident was caused by the deck wash hose being left running, leading to flooding in the forward hold. Robust routines that ensure all equipment and machinery is in a safe state should be in place, especially when everyone is asleep.

2. Audible alarms are vital to alert crew to danger. In this case, the audible bilge alarm had been disabled by the crew. This meant that they had no warning of the unfolding events and potentially missed an opportunity to stem the flood.

3. Fatigue is a common precondition in accidents. The crew of this vessel had been working excessive hours and were all completely exhausted. The skipper's decision to anchor overnight so everyone could get some rest was sensible, but better working practices could potentially have ensured that they were not exhausted in the first place.

4. The liferaft was out of date for service and, although the EPIRB had been activated, it took time for rescue services to reach the scene. This tragic accident demonstrates that the focus of fishing vessel owners, skippers and crews must be to operate safely and avoid the need to abandon ship. However, it is still critical that all lifesaving appliances are fully functional, in date for service and ready for immediate use if abandoning ship is the only option.

That Sinking Feeling…

Narrative

It was a fine sunny morning with just enough wind to ruffle the surface of the sea as the owner of a 6m GRP boat and his two crewmen set off from port. The three fishermen were in good spirits, intending to haul some static nets and hopefully catch some Dover sole.

The skipper had owned the boat for 5 years, having had it built from new, and he was justifiably proud of it. The boat had been built with modern materials to a traditional design, had flush deck hatches for access to the engine and a storage compartment, and five freeing ports on both sides (Figure 1). Although the skipper operated the boat on a part-time basis, it was registered with a fishing licence and represented a substantial investment. The MCA inspection was due in a few months and it was in the back of the skipper's mind that a few jobs needed to be done.

The boat arrived at the static nets, which were about 3nm offshore, and the men set about retrieving them with the hauler and stowing them in net bins forward. As the net bins filled, the boat started to trim by the head. Neither the skipper nor his crewmen noticed sea water starting to come through the freeing ports onto the deck and over the flush deck hatches.

The three fishermen were shocked when they saw that the boat's deck was awash. By then, the boat had started to sink rapidly beneath

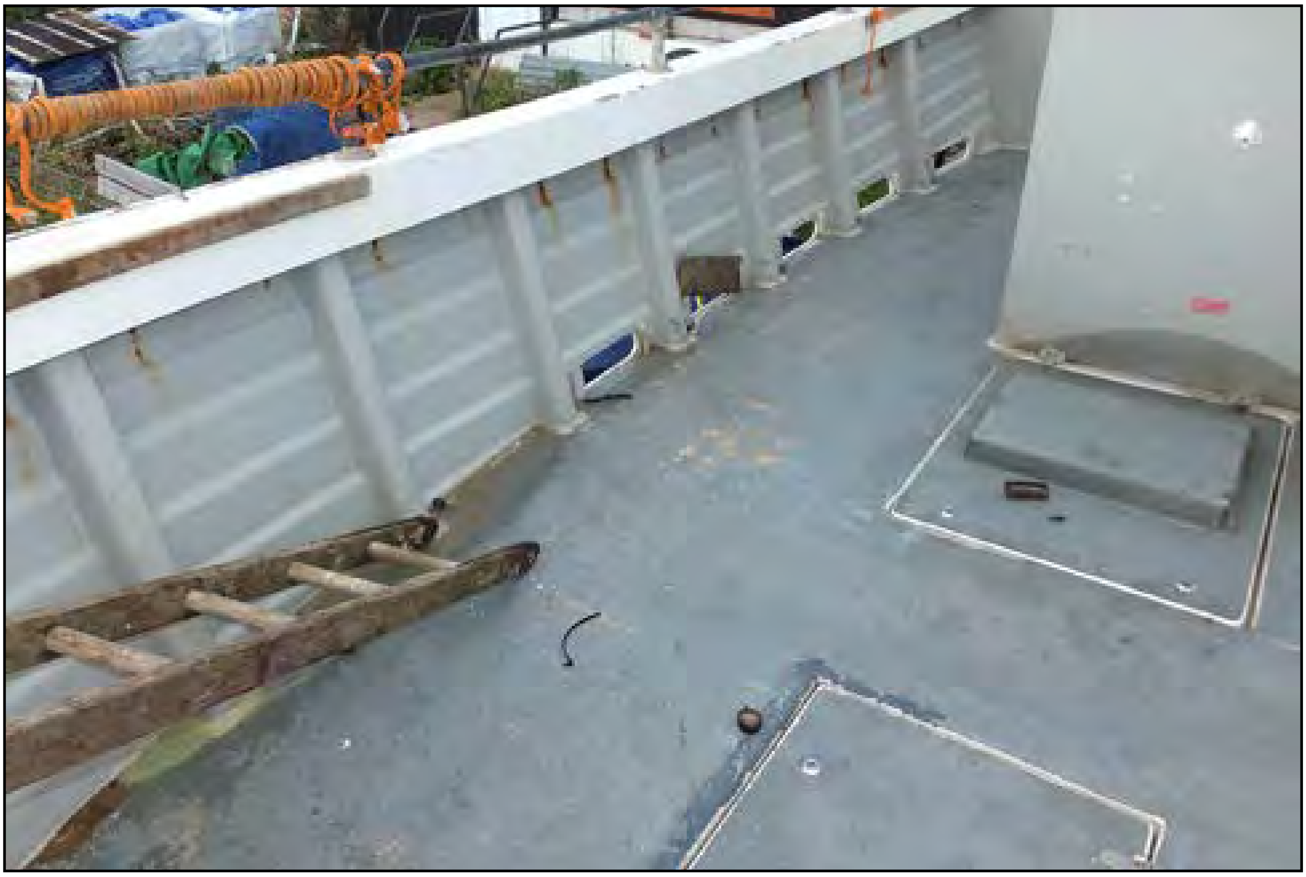


Figure 1: Freeing ports

them, so the skipper hurriedly transmitted a "Mayday" call to the coastguard. He and the crewmen then donned lifejackets and frantically tried to bail the water out of the boat.

About 6 minutes later the boat sank, and the men were left floating in the cold water. However, the coastguard had sent a lifeboat to their position, and within 30 minutes the men had been plucked from the water.

When the boat was recovered and beached a few days later, the deck hatch seals were found to be either missing or damaged (Figures 2 and 3). It is almost certain that while the deck had been awash, water had seeped down into compartments below and, although automatic bilge pumps were fitted in these, they failed to operate.

Figure 2: Missing hatch seal

Figure 3: Damaged hatch seal

The Lessons

1. **If not maintained and periodically checked, flush deck hatches provide instant access for water to get inside a boat and reduce its freeboard. The resulting potential for the loss of a boat puts the low cost of rubber seals and the minimal effort required to fit them into perspective.**

2. **Automatic bilge pumps only stay automatic for so long. Eventually they stop working, and it is better to find this out before they are needed. Make the testing of bilge pumps and float switches part of a regular routine.**

3. **Don't wait for an MCA inspection to ensure that your safety equipment is in date and works. Safety equipment is for 'safety' not compliance. Emergencies invariably occur without warning, and will not wait until after the next visit from the surveyor.**

4. **By themselves, personal flotation aids and "Mayday" calls increase the likelihood of survival. Used together, the likelihood is increased even further.**

Part 3 - Recreational Craft

Whilst studying for my teaching qualification there was a debate on the difference between education and training. The course lecturer put it to us that he would prefer his children to receive sex education rather than sex training.

Over the years I have transferred from the education sector to the delivery of various training courses. I've run numerous RYA sea survival and RYA first-aid courses and listened intently to participants describing their near misses and actual incidents, thinking I'm sure they could have been prevented.

Today, as a trainer in the recreation sector, I feel the weight of responsibility to emphasise the training with an education element. I go out of my way to help participants understand the reasons behind what they are being trained to do, and instil the importance of regularly refreshing their knowledge and understanding, alongside practising practical skills.

One evening, driving a RIB from Southampton to Yarmouth IOW, accompanied by my wife, we arranged to meet up with friends in another RIB at the Hamble Point South Cardinal. They approached and drifted towards us. I said 'he's not wearing a kill cord'. Knowing what my reaction would be, my wife said 'he doesn't like being told what to do, if you say something you'll upset him'! They pulled alongside, we all said hello, and instantly I said 'you're not wearing the kill cord'. He replied 'that's alright Steve, I always put it on when we get to the Solent'. At that point I put a question to myself: 'does he understand why the kill cord procedure is important at all times?'

Training can be of the highest quality, yet 'skill fade' is a concern and affects us all. It is essential that we refresh our learning and apply the training learnt on a regular basis - this keeps us up to speed and it helps prevent complacency.

First-aid training is a typical example of skill fade. Participants achieve a certificate of competence on the day, but 3 years later, if not used, will they remember the CPR ratio in a pressurised emergency situation?

Some of you reading this may have seen the video entitled Cold Water Casualty. Although it was released back in 1991, over the years it has served the RYA Sea Survival course and the RYA First-Aid course well. The video covers the effects of cold water shock as well as secondary drowning and the effects of hypothermia on the human body. There is a section towards the end of the video where surgeon Commander Rick Jolley RN emphasises 'prevention is better than the cure'.

I'm passionate about 'prevention is better than the cure'. For example I recommend that after participants have completed their courses, they read the RYA handbooks on a regular basis and practise the practical skills with their family, their workmates and their fellow crew members. It is essential they're not practising their skills for the first time in an emergency situation.

As they say, practice makes perfect practice. For myself, regularly teaching the RYA courses keeps me up to speed. I'm teaching others to recover life size MOB manikins from the water and am demonstrating CPR. We know that what counts is successfully putting the practice into action when events happen.

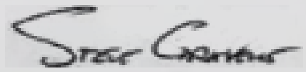
A recent example occurred whilst driving a RIB on my own in Southampton, when I came across a body underwater. I reached down a full arm's length to retrieve the casualty. The water was extremely cold, recovery conditions were challenging and I established the casualty was in respiratory arrest. I drove her to the nearest pontoon, she was breathing before the emergency services arrived. I completed the rescue without thinking because my skills were current and had been practised well enough to adapt to this difficult situation.

Years ago, I was in a RIB with a group travelling back to a marina (before plotters and depth sounders were fitted). It was a full moon and late at night. I became concerned about our position. There was a driver and a navigator. I asked the skipper, who was navigating, what the tidal heights were, and the reply I received was 'local knowledge'. I asked him again about our position and the tidal heights, he again said 'LOCAL KNOWLEDGE' just a little bit louder. I was so concerned that I asked the skipper to stop the boat. The skipper wasn't impressed and asked why I had asked him to stop the boat. I said 'if you look over there at the moonlight shimmering on the water there is a flock of seagulls, the question I am asking myself is, are those seagulls swimming or walking'. I took hold of the boat hook, extended it, put it into the water and was able to touch the seabed.

The skipper had taken a short-cut to get home more quickly, and had driven over a drying height without checking the chart or referring to depths and tidal heights. Earlier on in the evening we had left on a high water; it was now low water. A lesson to us all when navigating, even if we know the local area, is that we must be aware of our depths, tidal heights and our position.

Keeping practical skills refreshed, and practising the theory element develops a personal standard, good practice, role model; wearing a lifejacket, wearing a kill cord, knowing where you are on a chart, knowing what to do and being able to do it especially when it matters. It's not the first time that 'prevention is better than the cure' has been mentioned in these pages.

Whether we are operating commercially or in our own free leisure time we must do what it takes to prepare ourselves for the situations that we may come across. If we accept that skill (and knowledge) fade is a normal human condition, then we all need a plan of action to stay safe for ourselves and others.



STEVE GRAVELLS

During the early 1980s there were a number of tragic accidents involving pupils and students whilst on educational outdoor experiences, which included skiing, coastal walks and watersports. Steve identified that the root cause was a lack of guidance for organisers and a need for improved approval procedures. The Humberside County Council County Education department asked Steve to produce a working set of guidelines for Teachers, Lecturers and Youth Service Leaders and an approval system for Heads of Schools, College Principals and Youth Service managers. Within 18 months all policies were approved and implemented. Following this, Steve took a secondment to Plas Menai National Watersports Centre. On his return he trained and assessed Teachers and Youth Leaders for the County Education Department Outdoor Leader Awards.

Whilst as a Senior Lecturer at Grimsby College of Further and Higher Education, Steve set up a specialist Outdoor Education and Watersports Centre, delivering RYA and BCU courses in the docklands of Grimsby and the Humber Estuary. During this time, he also developed one of the first full time Uniformed Services and Active Occupations courses in the country; these courses featured sailing, kayaking and a range of other outdoor activities. The positive impact on student retention and personal development led to the development of other HND and Degree courses adopting experience-based outdoor learning. In 1996 Steve moved to Southampton Water Activities Centre (SWAC) where he led as Operations Manager for 12 years until 2008. He contributed to the broader outdoor scene by being one of the first APIOL Assessors and served as a NHS Community First Responder. Steve now owns and runs Tec Rec Coaching in Southampton which has become a well established RYA Training Centre and from day to day he is actively coaching, training, assessing, consulting and inspecting outdoor centres.

Weekend Bash

Narrative

It was a sunny, summer weekend and a commercially operated luxury catamaran was conducting a 3-day cruise in coastal waters. There were seven people on board; the professional skipper and six paying guests, some of whom had previous sailing experience.

Figure 1: CCTV imagery of the catamaran being swept onto the chain ferry just before the collision

After spending the Saturday afternoon anchored by a beach, the skipper intended to sail a short distance to a nearby harbour where the plan was to drop the anchor so the guests could go ashore for the evening. In the harbour's approach channel, the catamaran was steered into wind, the mainsail was lowered and the engine started in preparation for motoring to the anchorage.

A chain ferry operated a regular service across the narrow harbour entrance and, in accordance with local byelaws, all small vessels were required to keep clear of the ferry. The harbour entrance was also subject to strong tidal streams; at the time of the accident, there was about 3kts of stream flooding into the harbour.

As the catamaran approached the harbour entrance, one of the guests was steering it from the helming position on the port side, and the skipper was monitoring from the starboard helming position. The skipper noticed that the chain ferry was starting its crossing, so he told the guest at the port helm to engage astern gear and hold position to allow the ferry to pass ahead.

When attempting to hold position using astern power, control of the catamaran was lost and it was swept sideways towards the crossing ferry by the strong tidal stream. Realising that the situation was deteriorating the skipper transferred throttle control to the starboard side console then applied full power ahead on the port engine and maximum starboard rudder in an attempt to steer away from the chain ferry (Figure 1). However, this was unsuccessful and the catamaran's port side made heavy contact with the ferry.

The skipper made a "Pan Pan" emergency radio call and checked that all the guests were safe. Soon afterwards, a harbour patrol boat and the inshore lifeboat were on hand to help the catamaran safely alongside. There were no injuries but the catamaran was damaged by the collision (Figure 2).

Figure 2: Collision damage to the catamaran's port quarter

The Lessons

1. Passage planning is a vital part of safe navigation. The luxury catamaran was less than a year old and this was the first time it had been taken into this particular harbour by the skipper. Although aware of the tidal stream, the skipper was not familiar with the local regulations that required small craft to keep clear of the chain ferry. In such circumstances, it is vital that all aspects of the passage plan are addressed and that careful thought is paid as to how the local conditions might influence safe navigation. Planning should include checking the pilot books and harbour authority websites or guidebooks for up to date local information. Once the catamaran was heading across the tidal stream, there was very little that could be done to recover the situation. With more detailed passage planning, the risks associated with the tidal stream and the obligation to avoid the chain ferry would have been more apparent, potentially leading to a safer plan.

2. Holding position by stemming the tidal stream using astern propulsion is a tricky seamanship manoeuvre in any vessel. Even in a twin-engine catamaran it would require a high degree of skill on the part of the helmsman. In this collision, vital time to escape the deteriorating situation was lost when the boat was side onto the stream, and when control was transferred by the skipper. As soon as it became apparent that there was going to be a requirement to avoid the chain ferry, the boat's heading could have been reversed so it was heading into the stream away from the ferry, resulting in a higher degree of ship-handling control.

3. Managing guests on board commercially operated yachts is a significant planning factor for the crew. On previous charters this catamaran had been operated by two crew members; however, on this trip the skipper was the only professional crew member. This decision had been taken by the managing company because some of the guests had previous sailing experience and it was assumed that they would be able to assist the skipper. However, even guests with previous sailing experience can be a distraction for the crew on a commercially operated yacht. Therefore, it is important to assess all the risks and associated tasks, including guest management, to ensure the vessel is operated safely.

A Wave of Pain

Narrative

A female passenger suffered a severe back injury during a fast RHIB ride off the south coast of England. She was one of a group of eight passengers enjoying a corporate team-building exercise. The injury occurred as the boat rode over the wash of a passing vessel.

On the morning of the accident, the group gathered on the quayside and received a safety briefing from the skipper of the 8.6m RHIB. During the briefing the skipper helped the passengers don their lifejackets and told them what actions to take in the case of an emergency. He concluded the briefing by reading a statement from the RHIB ride company's insurers, which contained a warning about the physical risks to individuals participating in fast RHIB rides.

The RHIB had two rows of foam-filled jockey seats behind the skipper's helm position (Figure 1). After advice from a work colleague who had previously been on a RHIB ride, the casualty decided to sit at the back of the boat, having been told that these seats would provide a more comfortable ride.

After about an hour on the water, the RHIB encountered the wake of a passing vessel. Aware of the potential effect on his passengers, the skipper slowed the boat down and crossed the wake at a 90° angle to the wash waves. The first wash wave was crossed without incident, but on crossing the second wave the boat landed heavily. The seated female passenger screamed out in severe pain as she felt the shock of the impact in her back. It was immediately apparent to the skipper that she had suffered a potentially serious back injury so he immediately stopped the boat. After using the boat's VHF radio to consult a colleague, the skipper made the decision to proceed at slow speed to a nearby marina. He did not call the coastguard.

Two telephone calls were made to the local ambulance service requesting that it attend the casualty at the marina. But the ambulance failed to turn up. The injured passenger was assisted off the boat and taken to the local hospital by her husband for diagnosis and treatment. She remained in hospital for a few days while being treated for a compression fracture of her T12 vertebra (Figure 2).

Figure 1: Jockey seats behind skipper's helm position

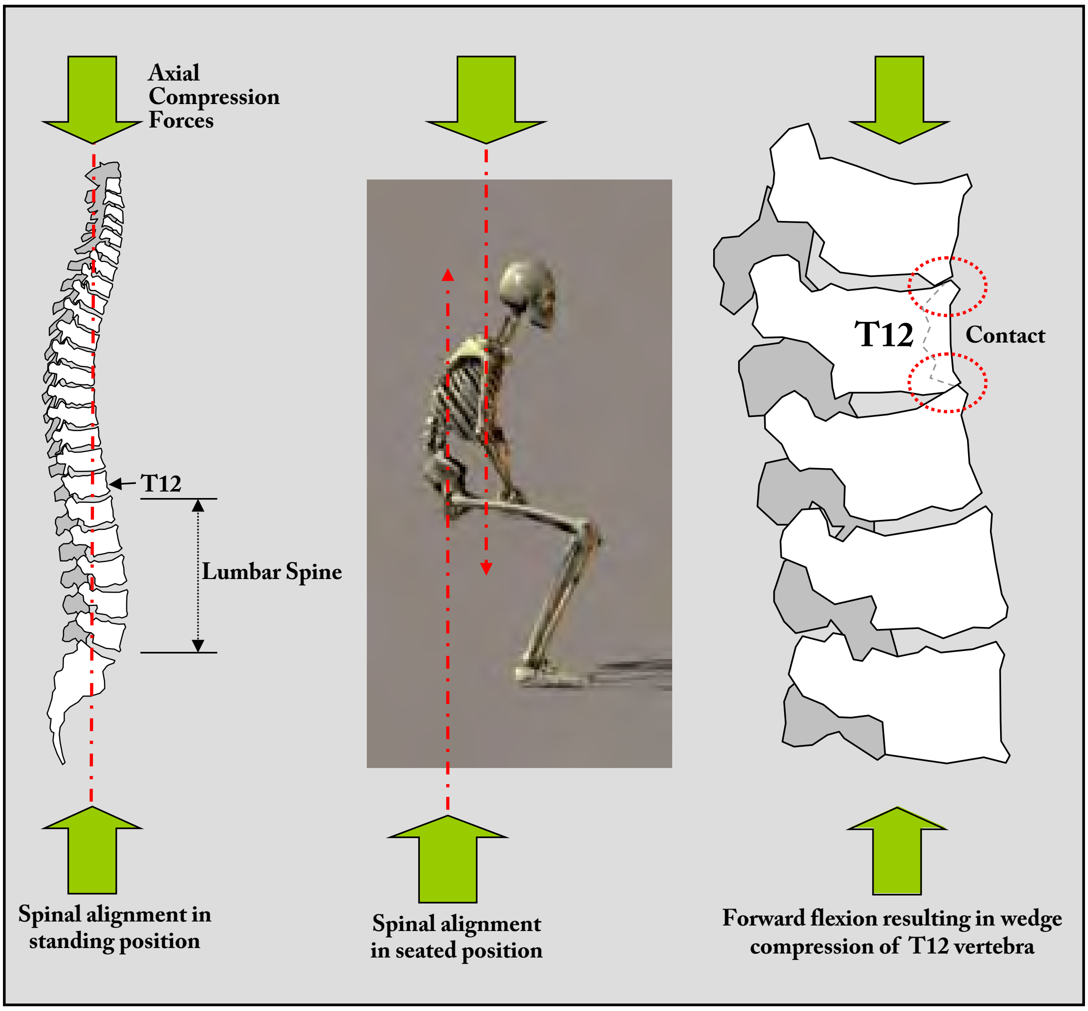


Figure 2: Spinal alignment and wedge compression effect when boat slams into the water

The Lessons

1. Lower back compression fractures can occur when a RHIB passenger lands heavily on their seat after being lifted into the air due to the motion of the vessel. Those in control of a boat should be aware that if crossing large waves at an acute angle, the boat speed must be reduced dramatically to prevent it from slamming and potentially injuring its occupants.

2. Skippers must ensure that all crew and passengers understand the safety briefings and that the risks and levels of physical stress that they are likely to be exposed to are fully appreciated. A demonstration of the correct posture to adopt and best means of holding on can help passengers understand the brief.

3. If an emergency arises on board any boat, the coastguard should be informed at the earliest opportunity. They can then make available an appropriate level of emergency response in a timely manner. In this case, despite an apparent back injury the casualty was moved, had to walk off the boat, and was transported by car to hospital. The National Institute for Health and Care Excellence recommends, inter alia, the following:

   a. protect the person's cervical spine with manual in-line spinal immobilization
   b. avoid moving the remainder of the spine

Turning into Sand

Narrative

A large commercially operated yacht was taking part in an ocean race. There was a professional skipper in charge and the rest of the crew were amateur sailors, some of whom had previous sailing experience. The following accident happened on the first day of the race.

After the start, the fleet of yachts headed out to sea but needed to pass a headland before commencing the ocean crossing. After dark, one of the yachts was sailing downwind with its mainsail and a spinnaker hoisted. The yacht was on a heading that would take it safely past the headland and into the open sea. However, over about an hour, the true wind backed by around 70 degrees. To maintain the same relative wind direction and prevent a potentially dangerous accidental gybe, the crew made a succession of small alterations of course to port. These course changes had the effect of driving the yacht unintentionally close inshore (Figure 1).

The skipper had been monitoring the situation and realised that the yacht needed to be turned away from danger. However, soon after this turn was made, the yacht grounded and could not be freed. There was a delay of nearly an hour in alerting the coastguard; however, once they had been alerted, all the yacht's crew were rescued into lifeboats. The yacht could not be salvaged and was cut up on the beach where it had grounded (Figure 2).

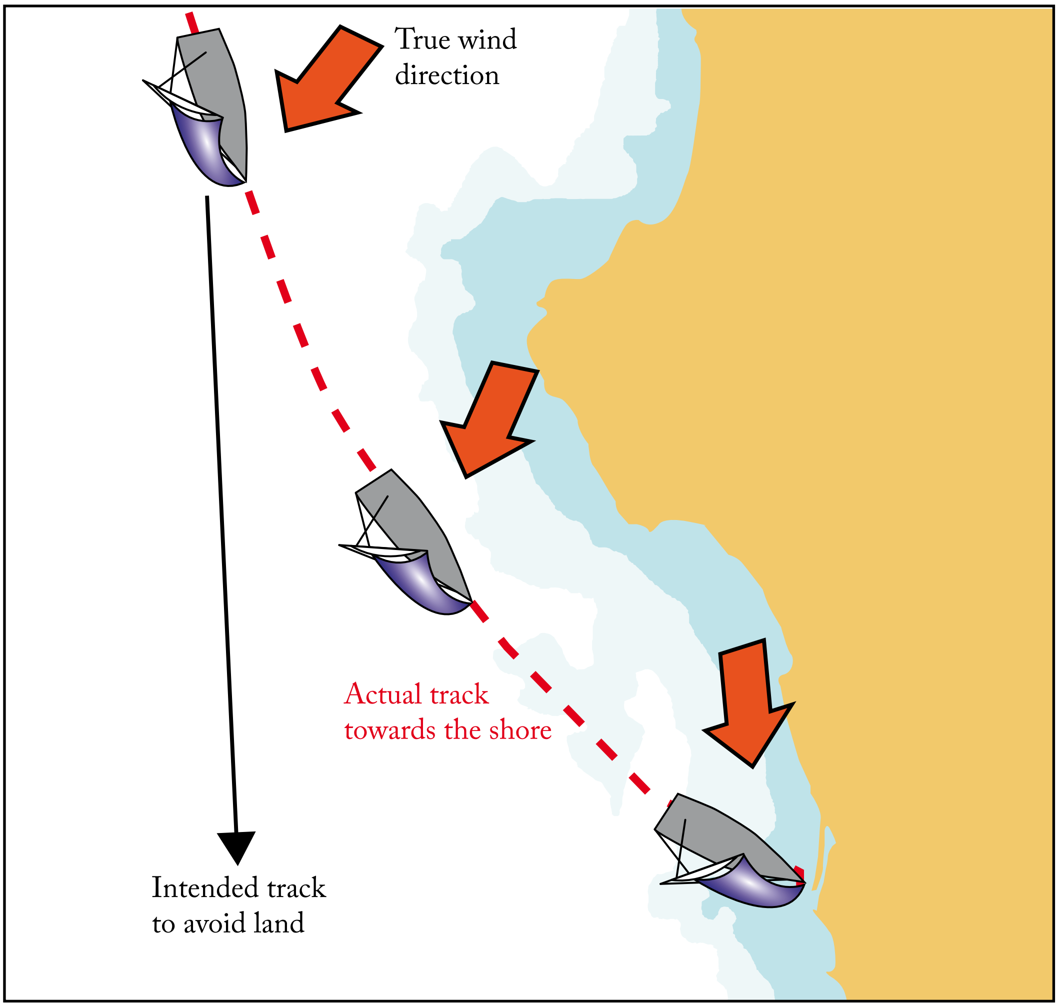


Figure 1: The intended and actual tracks of the yacht


Figure 2: The stranded yacht on the beach

The Lessons

1. Every vessel, whatever its size or purpose, needs a passage plan that has identified all potential hazards for the voyage ahead. In this case, the skipper had intended to head away from land after the race start so was not planning to sail close to the shore. This meant that there was little expectation of having to manage coastal navigation. Nevertheless, the requirement to pass the headland meant that the passage plan should have assessed the risks of operating in shallow water.

2. When things start to go wrong on a yacht when inshore, safe navigation must remain a high priority. The skipper was the only person closely monitoring the navigation. Unfortunately, when the situation started to deteriorate, the skipper was required to be on deck to supervise the crew handling and turning the yacht. This meant that no-one was monitoring the plotter at the navigation station down below, and there was no plotter on deck. As a result, no-one understood the immediate risk of grounding. It was also unhelpful that it was dark and hazy with an unlit foreshore, which meant that there were few visual clues to the close proximity to land.

3. When properly set up, alarms can provide vital warning of danger. There were no navigational alarms set on the yacht; the electronic navigation system did not have safety depths set and, although the echo sounder was running, the audible shallow water alarm was turned off. The yacht was well-equipped with a suite of capable modern electronic safety equipment that could have helped to warn the crew of danger ahead.

4. Any vessel in a distress situation should call for assistance as soon as possible. In this accident, the crew did not make an immediate "Mayday" or "Pan Pan" emergency call on VHF radio. Had this been done, it is highly likely that the local coastguard would have heard the call immediately and the crew could have been rescued earlier.

A Tragic Slip

Narrative

The owner of a RHIB and a friend rowed a small inflatable dinghy out to the moored RHIB to bail out rain water (Figure 1). It was a blustery afternoon so both men were wearing warm clothing, waterproof jackets and wellington boots; neither man was wearing a lifejacket or buoyancy aid.

On arrival they tied the dinghy to the RHIB and climbed on board. Once the RHIB's bilges were dry, the owner climbed back into the dinghy. He then untied the dinghy and held it alongside to allow his friend to board. While stepping between the two boats the owner's friend slipped and fell into the water, taking one of the dinghy's oars with him.

The fall caused the owner to lose his grip on the RHIB. Once adrift, the dinghy was blown quickly towards the shore and came to rest on a patch of kelp. The RHIB owner's friend started to swim towards the dinghy but after a couple of minutes his head disappeared below the surface. The owner could see his friend lying face-down in the water but was unable to row to him through the wind using the one remaining oar. The owner tried to raise the alarm by shouting and waving his arms to attract the attention of those on shore.

After several minutes, the owner attracted the attention of a passing delivery van driver and a local doctor. The van driver ran to the water's edge, and without hesitation swam out to the casualty and pulled him ashore. Once the casualty had been recovered onto the beach the driver and doctor attempted to resuscitate him. Despite their extensive efforts he could not be revived.

Figure 1: The RHIB and the dinghy

The Lessons

1. The difficulty of trying to swim in cold sea water without the support of a buoyancy aid or lifejacket cannot be over emphasised. The owner and his friend routinely wore lifejackets when they took the RHIB to sea but did not wear them when rowing to the mooring to bail the boat. The risk of falling overboard when transferring from boat to boat is high and therefore it is essential that buoyancy aids and lifejackets are always worn.

2. Stepping between boats is always hazardous. In this case the owner's friend attempted to step from one boat to the other, across both flotation tubes, wearing wellington boots. Had the friend lowered his centre of gravity by sitting on the RHIB's side tube, holding on to a lifeline, swinging first his legs and then his body into the dinghy (Figure 2), he would have remained in control of his movement throughout, significantly reducing the risk of his falling overboard. Similarly, had suitable non-slip footwear been worn, the risk of slipping would have been reduced.

3. Once the owner realised that he could not get to his friend there was little he could do without risking his own life. In this case, the carriage of a rescue throw line in the dinghy might have helped.

4. The owner struggled to raise the alarm. The carriage of a portable VHF radio or even a whistle in this case would have helped.

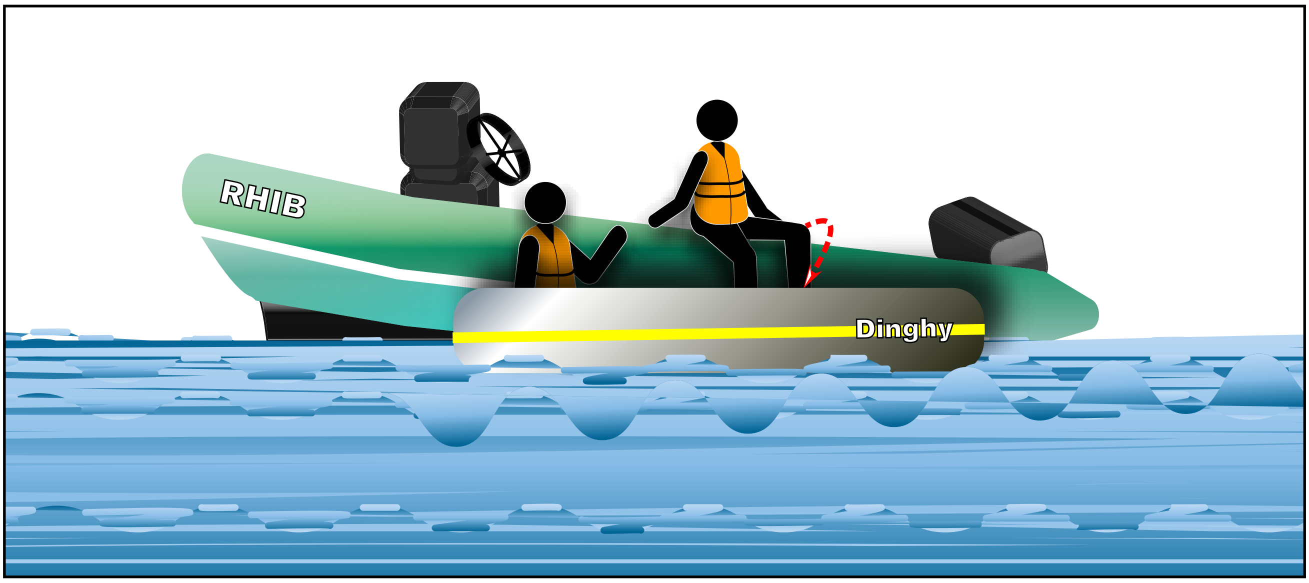


Figure 2: Safe transfer - sitting on the RHIB's side tube to safely transfer to the dinghy and wearing appropriate safety gear (illustrative purposes only: not to scale)

APPENDIX A

INVESTIGATIONS STARTED IN THE PERIOD 1/09/18 TO 28/02/19

Date of Occurrence	Name of Vessel	Type of Vessel	Flag	Size	Type of Occurrence
29/09/2018	*Red Falcon/* *Phoenix*	Passenger ro-ro cargo Motor cruiser	UK UK	4128 gt Unknown	Collision
21/10/2018	*Red Falcon/* *Greylag*	Passenger ro-ro cargo Motor cruiser	UK UK	4128 gt Unknown	Collision
06/11/2018	*Stena Superfast VII/* Royal Navy submarine	Passenger ro-ro cargo Submarine	UK UK	30 285 gt Unknown	Hazardous incident
14/12/2018	*Wight Sky*	Passenger ro-ro cargo	UK	2546 gt	Fire
15/12/2018	*Thea II/* *Svitzer Josephine*	General cargo Tug	Cyprus UK	2899 gt 364 gt	Groundings
17/12/2018	*Seatruck Pace*	Ro-ro cargo	Cyprus	14 759 gt	Accident to person (1 fatality)
18/12/2018	*Kuzma Minin*	Bulk carrier	Russia	16 257 gt	Grounding
18/12/2018	*European Causeway*	Passenger ro-ro cargo	Bahamas	20 646 gt	Cargo shift
17/01/2019	*Tiger One*	Recreational yacht	UK	Unknown	Contact
27/01/2019	*Millgarth*	Tug	UK	374 gt	Accident to person (1 fatality)
03/02/2019	*Investor*	Fishing vessel | Potter	UK	8.92 gt	Capsize | Foundering
28/02/2019	*Cherry Sand*	Dredger	UK	1081 gt	Accident to person (1 fatality)

Reports issued in 2018

Windcat 8
Catastrophic engine failure and subsequent fire on a 15 metre windfarm crew transfer vessel off the Lincolnshire coast, England on 7 September 2017.
Report 1/2018 Published 28 February

James 2/Vertrouwen
Collision between a fishing vessel and a motor cruiser in Sussex Bay off Shoreham-by-Sea, England on 6 August 2017 resulting in the motor cruiser *James 2* sinking with the loss of 3 lives.
Report 2/2018 Published 8 March

Saga Sky/Stema Barge II
Collision between the general cargo ship *Saga Sky* and the rock carrying barge *Stema Barge II* resulting in damage to subsea power cables off the Kent coast, England on 20 November 2016.
Report 3/2018 Published 15 March

Constant Friend
Fatal man overboard from a stern trawler in Kilkeel Harbour, Northern Ireland on 23 September 2017.
Report 4/2018 Published 22 March

Enterprise
Fatal man overboard from a potter off Scarborough, England on 6 November 2017.
Report 5/2018 Published 11 April

Formula 4 powerboats
Collision between two powerboats on Stewartby Lake, Bedfordshire, England resulting in 1 person injured on 2 July 2017.
Report 6/2018 Published 12 April

Huayang Endeavour/Seafrontier
Collision between the bulk carrier *Huayang Endeavour* and the oil tanker *Seafrontier* in the Dover Strait, English Channel on 1 July 2017.
Report 7/2018 Published 26 April

Ocean Prefect
Groundings made by a bulk carrier while approaching Ahmed Bin Rashid Port in Umm Al Qaywayn, United Arab Emirates on 10 and 11 June 2017.
Report 8/2018 Published 27 April

Islay Trader
Grounding of a general cargo vessel near Margate beach, Kent, England on 8 October 2017.
Report 9/2018 Published 10 May

Ocean Way
Flooding and sinking of a stern trawler while north-east of Lerwick, Scotland on 3 March 2017.
Report 10/2018 Published 24 May

Ruyter
Grounding of a general cargo vessel on the north shore of Rathlin Island, Northern Ireland on 10 October 2017.
Report 11/2018 Published 21 June

CV24
Grounding and loss of a commercially operated yacht on Cape Peninsula, South Africa on 31 October 2017.
Report 12/2018 Published 28 June

Varuna
Fatal man overboard from a creel fishing vessel while west of Camusterrach, Scotland on 20 November 2017.
Report 13/2018 Published 4 July

Wight Sky
Catastrophic engine failure on a ro-ro passenger ferry while approaching Yarmouth on the Isle of Wight, England on 12 September 2017 resulting in a fire and serious injury to an engineer.
Report 14/2018 Published 19 July

Illustris
Fatal man overboard from a stern trawler in Royal Quays Marina, North Shields, England on 12 November 2017.
Report 15/2018 Published 9 August

Eddystone/Red Eagle
Unintentional release of carbon dioxide from a fixed fire-extinguishing system on the ro-ro cargo vessel *Eddystone* while in the southern Red Sea on 8 June 2016 and a similar incident on the ro-ro passenger ferry *Red Eagle* while on passage from the Isle of Wight to Southampton, England on 17 July 2017.
Report 16/2018 Published 12 September

CMA CGM Centaurus
Heavy contact with the quay and two shore cranes by a container vessel at Jebel Ali port, United Arab Emirates on 4 May 2017.
Report 17/2018 Published 18 October

Celtic Spirit
Dragging anchor by the general cargo vessel *Celtic Spirit* and subsequent collisions with the research and survey vessel *Atlantic Explorer* and general cargo vessel *Celtic Warrior* in the River Humber, England on 1 March 2018.
Report 18/2018 Published 31 October

North Star
Fatal man overboard from creel fishing vessel while 16nm north of Cape Wrath, Scotland on 5 February 2018.
Report 19/2018 Published 8 November

Solstice
Capsize and sinking of fishing vessel approximately 7 miles south of Plymouth, England with loss of 1 life on 26 September 2017.
Report 20/2018 Published 6 December

SMN Explorer
Uncontrolled closure of a hatch cover resulting in one crew fatality on the cargo vessel in Alexandra Dock, King's Lynn on 1 February 2018.
Report 21/2018 Published 13 December

Reports issued in 2019

Celtica Hav
Grounding of a general cargo vessel in the approaches to the River Neath, Wales on 27 March 2018.
Report 1/2019 Published 24 January

Unnamed rowing boat
Failure of a throw bag rescue line during a capsize drill in a swimming pool in Widnes, England on 24 March 2018.
Report 2/2019 Published 31 January

Pride of Kent
Contact and grounding of a ro-ro passenger ferry while departing the Port of Calais, France on 10 December 2017.
Report 3/2019 Published 21 February

Safety Bulletins issued during the period 1/09/18 to 28/02/19

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB4/2018

October 2018

Extracts from
The United Kingdom Merchant Shipping (Accident Reporting and Investigation) Regulations 2012

Regulation 5:
"The sole objective of a safety investigation into an accident under these Regulations shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of such an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

Regulation 16(1):
"The Chief Inspector may at any time make recommendations as to how future accidents may be prevented."

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020 7944 4292

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0300 330 3000

NOTE

This bulletin is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

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Working in refrigerated salt water tanks

Fatal enclosed space accident on board the fishing vessel *Sunbeam* (FR487) at Fraserburgh, United Kingdom on 14 August 2018

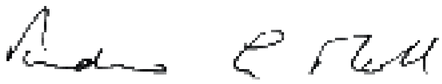
MAIB SAFETY BULLETIN 4/2018

This document, containing safety lessons, has been produced for marine safety purposes only, based on information available to date.

The Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 provide for the Chief Inspector of Marine Accidents to make recommendations at any time during the course of an investigation if, in his opinion, it is necessary or desirable to do so.

The Marine Accident Investigation Branch is carrying out an investigation into a fatal enclosed space accident on board the fishing vessel *Sunbeam* on 14 August 2018.

The MAIB will publish a full report on completion of the investigation.



Andrew Moll
Chief Inspector of Marine Accidents

NOTE

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BACKGROUND

Sunbeam **(Figure 1)** was a 56m UK registered pelagic trawler. Its home port was Fraserburgh, Scotland, and it was typically manned by a crew of eleven. In the weeks prior to the accident, it had been fishing for herring in the North Sea and landing its catch in Lerwick, Shetland. The vessel had nine refrigerated salt water (RSW) tanks for storing its catch.

On 10 August 2018, *Sunbeam* arrived at Fraserburgh. It had caught and landed its seasonal quota of herring and was being prepared for a planned refit period. During the refit the vessel's owner intended to replace *Sunbeam*'s refrigeration plant.

Figure 1: FV *Sunbeam*

INITIAL FINDINGS

At about 0900 on 14 August, *Sunbeam*'s crew arrived at the vessel's berth ready to begin work. The vessel's refrigeration plant had been shut down after landing the final catch at Lerwick, and its RSW tanks had been pumped out and tank lids opened in preparation for deep cleaning. At some time between 1200 and 1350, *Sunbeam*'s second engineer entered the aft centre RSW tank **(Figure 2)** and collapsed.

At about 1350, the second engineer was seen lying unconscious at the aft end of the tank by a crewmate, who immediately raised the alarm. Three of the vessel's crew entered the tank and tried to resuscitate the second engineer but they soon became dizzy, confused and short of breath. One of the crew managed to climb out of the tank unaided, the other two crewmen and the second engineer were recovered onto the open deck by two crewmen wearing breathing apparatus. The two crewmen made a full recovery, but the second engineer could not be resuscitated and died.

It is unclear when and why the second engineer entered the tank. However, evidence indicated that his intention was to sweep the residual seawater that had settled at the aft end of the tank forward in to the tank's bilge well. No safety procedures for entering or working in RSW tanks had been completed before he entered the tank.

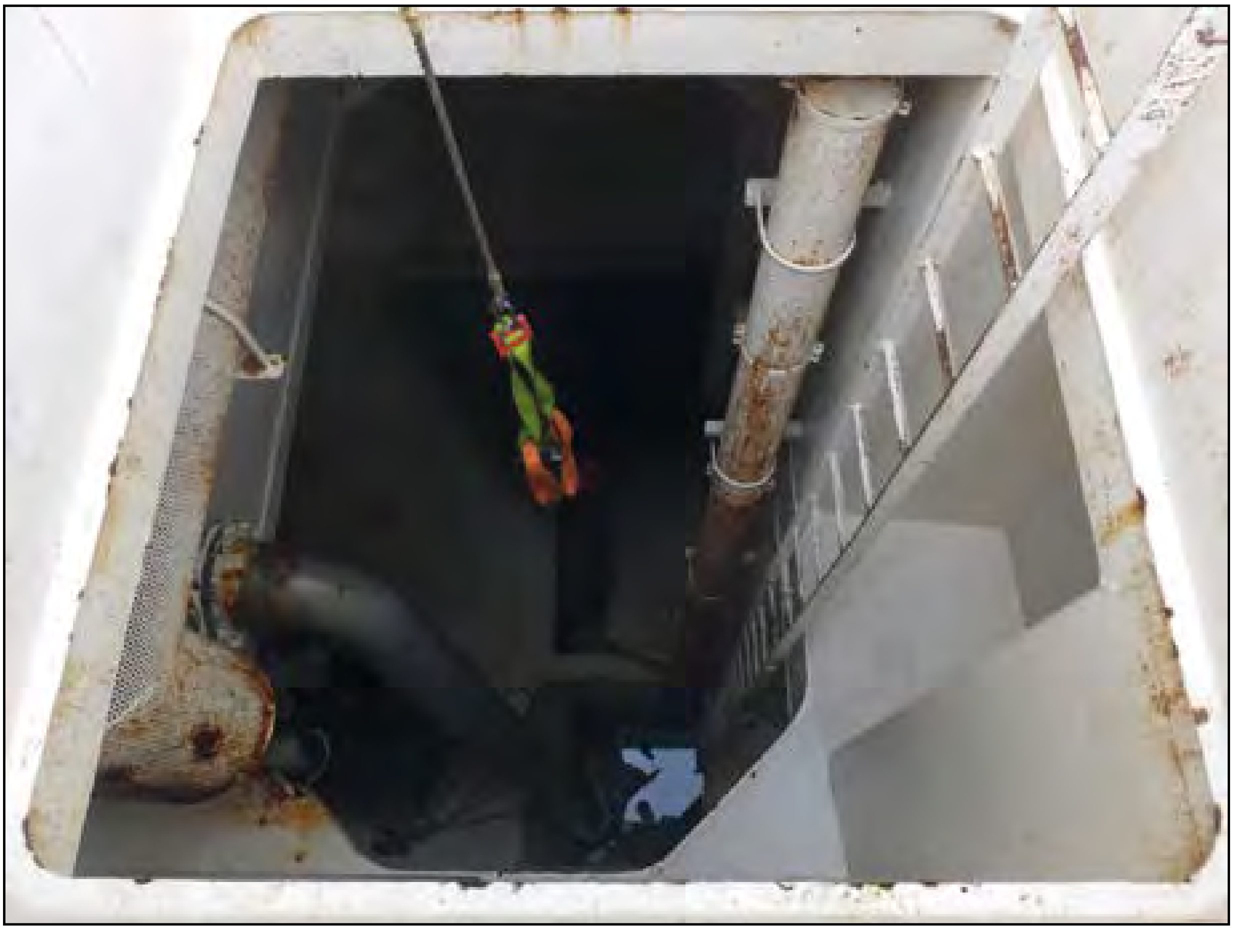

Figure 2: Aft centre RSW tank

Tests of the atmosphere in the tank following the accident showed that the level of oxygen at the bottom was less than 6% (normal level should be 20.9%). Further tests of both the tank atmosphere and residual water samples showed the presence of Freon R22, the refrigerant gas used in the RSW tank's refrigeration plant.

The MAIB's initial investigation identified that the refrigeration plant sea water evaporators had suffered several tube failures resulting in a number of repairs **(Figure 3)**. It is likely that the refrigerant leaked through one or more failed tubes into the seawater system, and was released into the RSW tank. Freon R22 is four times heavier than air so it will displace oxygen at the bottom of an enclosed space, such as an RSW tank. It is a toxic, tasteless and mostly odourless gas. If it is deeply inhaled, it can cut off vital oxygen to blood cells and lungs.

SAFETY LESSONS

The RSW tanks on board *Sunbeam* were, by design, enclosed spaces that did not have a fixed means of positive ventilation. Such spaces can become dangerously hazardous to life. The atmosphere in the tanks can become oxygen deficient through the effects of corrosion, or toxic through the decomposition of sludge or fish, or, as in this case, the accidental release of gas. Other hazards, such as flooding and heat exhaustion can also be a threat to life.

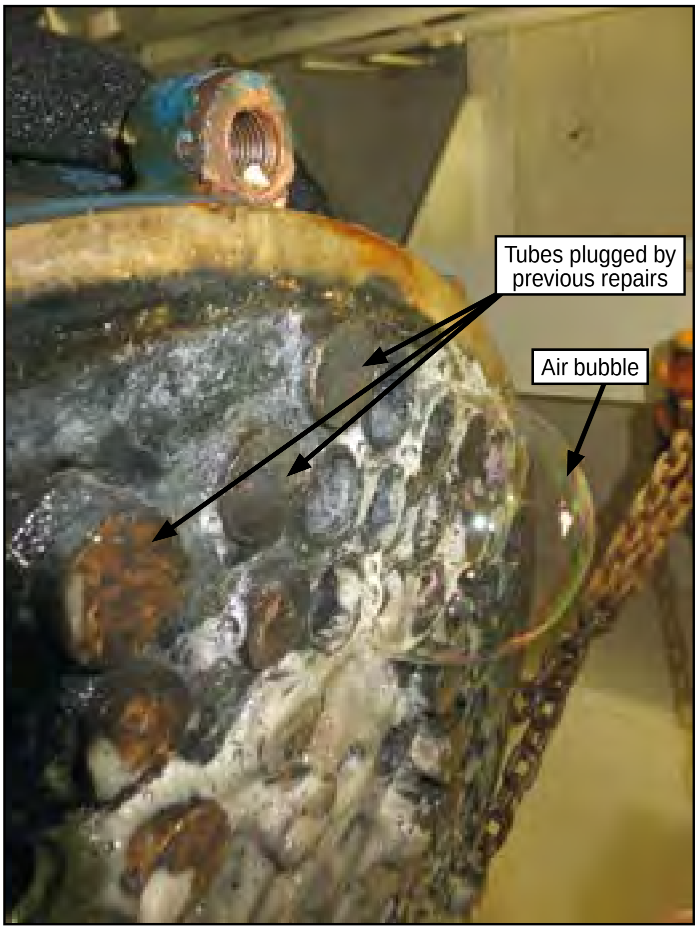

Figure 3: Starboard evaporator tube leak

It is the responsibility of vessel owners/operators to ensure that suitable measures are taken to safeguard the crew. All work activities should be subject to risk assessment and safe systems of work should be put in place. Working in enclosed spaces is particularly hazardous, and procedures for entering and working in them should be robust and understood. Similarly, rescue plans need to be put in place and fully understood and should be practised.

Widely recognized safety controls for working in enclosed spaces include:

- Atmosphere testing.
- Provision of positive ventilation.
- Safety sentry at entry point.
- Breathing apparatus available for rescue team.
- Safety harness and means of recovering an unconscious person.

It is also the responsibility of crew members to behave in a safe manner. This is particularly important when working alone.

This was a tragic accident, which nearly resulted in multiple fatalities. The crew did not appreciate the levels of risk they were taking, even after the second engineer had collapsed. The Maritime and Coastguard Agency provides further guidance in its Marine Guidance Note MGN 309 (F) Fishing vessels: the dangers of enclosed spaces, and the Fishermen's Safety Guide. The findings from an investigation into a similar accident on board the pelagic trawler *Oileán An Óir*, in Ireland in 2015, which resulted in two fatalities, also highlight the potential dangers of RSW tanks.[1]

RECOMMENDATION

Sunbeam's owners are recommended to:

S2018/129 Conduct risk assessments specifically for entering and working in RSW tanks and provide safe operating procedures for its crew to follow and appropriate levels of safety equipment to use.

Safety recommendations shall in no case create a presumption of blame or liability

[1] The Department of Transport, Tourism and Sport in Ireland issued Marine Notice No.43 of 2016.

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